Overview of the Accident

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On September 12, 2004 at approximately 1345 hours seven members of California Department of Forestry and Fire Protection (CDF) Columbia Helitack (Copter 404) crew had to take emergency action when a sudden wind shift and fire flareup overran their position. Three Firefighters suffered minor injuries and Firefighter Eva Schicke was entrapped and killed.

Situation

Location

The fire was located near the bottom of the Tuolumne River Canyon (1450' elevation) three miles east of Groveland, California on the Stanislaus National Forest (STF) in Tuolumne County. The Tuolumne River Canyon is a major Sierra Nevada river drainage that has steep canyon sides and is 2,000 feet deep at the accident site. The fire originated approximately ½ mile downstream of the Lumsden Bridge along Lumsden Road.

Topographic map of accident site.

Fuel

During the initial attack, the fire was burning in light, flashy surface fuels. The fuels were predominately live oak leaf litter, light grass and mixed brush, with an oak overstory consistent with Fuel Model 2. One-hour fine dead fuel moisture was estimated at four to five percent and live fuel moistures were at critical stage.

Topography

The Tuolumne River Canyon is a major Sierra Nevada river drainage characterized by a meandering river channel with numerous tributary canyons and ridges. Slopes range from 80 to 120 percent. Deep river drainages, such as the Tuolumne River, frequently experience wind shifts

and eddies. Local airflow is influenced by the physical shape of the terrain in the canyon causing wind eddies. Review of the Air Attack 440 video and post-incident observations on the ground indicate the first 75 to 100 vertical feet above the entrapment location may have been particularly sensitive to this occurring.

Variations in aspect and fuels create localized heating differences contributing to changeable air flow patterns. Local airflow is influenced by in-drafts into the fire above the road that are occasionally strong enough to briefly override the up-canyon wind, creating occasional wind shifts.

The fire started below Lumsden Road on the south side of the river.

Tuolumne River Canyon looking South. Fire and accident site is in center of photo.

Weather

Temperature:	89-94 F
Relative Humidity:	18-24 %
Wind:	Predominately steady up-canyon, estimated 3-5 mph.[1]

No critical fire weather patterns (thunderstorms, frontal passage, etc.) were in place.

Fire Discovery and Dispatch

The Tuolumne Fire was reported by STF Duckwall Lookout at 1233 hours. The visible smoke column put the fire near the Sweetwater Campground, 5 miles east of Buck Meadows. At 1245 STF Smith Peak Lookout's cross on the smoke column put the fire in the bottom of the Tuolumne River canyon near South Fork Campground. STF dispatched a standard wildland fire response that consisted of:

STF Division Chief, Division 4, Allen Johnson, (IC)

CDF Battalion Chief Julie Henriques, Battalion 4416

STF Engine 42, STF Buck Meadows Fire Station

STF Water Tender 42, STF Buck Meadows Fire Station

STF Engine 43 Captain Tammy Mount, STF McDiarmid Fire Station

STF Engine 44, Cherry Lake Fire Station

CDF Engine 4490 Captain John Yount, CDF Groveland Fire Station

CDF Engine 4476 FAE Kevin Craddock, CDF Groveland Fire Station

CDF Engine 4468, CDF Green Springs Fire Station

CDF Air Attack 440, Battalion Chief Dan Ward (ATGS), Pilot Colin Rogers, Columbia Air Attack Base

Air Tanker 82, Columbia Air Attack Base

Air Tanker 83, Columbia Air Attack Base

CDF Copter 404, Columbia Air Attack Base

[1] Prior to the burnover numerous observers (Air Attack 440, Copter 404 pilot, IC and Helitack Crew 404) reported that the wind had remained light and steady flowing in an up-canyon direction.

At 1245 hours Copter 404 was dispatched, along with CDF Air Attack 440, Tanker 82 and Tanker 83 (S-2 T airtankers), from their home base in Columbia, California (22 miles northwest of the fire). Copter 404 is a UH-1H Super Huey (ICS type 2) helicopter with a crew of nine, consisting of a pilot, two Helitack Captains (HC) and six firefighters (FF).

The Copter 404 crew consisted of:

Copter 404 Pilot Tom Eggleston
Copter 404 Captain Frank Podesta
Helitack Captain Jonah Winger
Firefighter Josh Agustin
Firefighter Jon Andahl
Firefighter Jeff Boatman
Firefighter T.J. Fraser
Firefighter Shane Neveau
Firefighter Eva Schicke

All members of the helitack crew met the training and experience requirements for their assignment and were well rested.

Initial Attack on the Fire

The fire was located east of Groveland in the Stanislaus National Forest. It burned on both sides of Lumsden Road in the bottom of the Tuolumne River Canyon near Lumsden Bridge. The fire was backing down-slope below the road and spreading rapidly above the road up the south canyon face. At this point in the canyon, the river course turns from east-west to north-south for a short distance. Thus the fire was on a slope that faced west.

At 1259 hours Air Attack 440 (Battalion Chief Dan Ward and Pilot Colin Rogers) arrived over the fire. Ward was designated as Tuolumne Air Tactical Group Supervisor (ATGS). The fire had burned five to ten acres and was spreading up-slope and up-canyon pushed by a steady 3-5 mph up-canyon wind. ATGS Ward directed the two air tankers to make retardant drops on the right flank on the upper section of the fire; they were unable to get lower on the slope due to the canyon's steepness.

Copter 404 arrived over the fire at approximately 1305 hours. After waiting for the air tankers to clear, HC Winger and the six firefighters were dropped off by Copter 404 on a gravel bar at the confluence of the South Fork of the Tuolumne River and the Tuolumne River, approximately ¾ mile downstream of the fire. They walked from their landing zone to Lumsden Road near South Fork Campground and then toward the right flank of the fire. They were the first ground resources to take action on the fire.

They had the following complement of tools:

5 Bladder style backpumps
5 Scraping tools (Rhyno style)
1 Chainsaw
1 Gas fuel pack for chainsaw
2 portable radios

The seven firefighters from Copter 404 hiked to Lumsden road (black arrow shows walkout route) after being dropped off on gravel bar landing zone (red "x").

On the assigned tactical frequency, ATGS Ward directed Copter 404 Captain Podesta to make water drops on the right flank. The instructions from ATGS Ward were to start at the bottom and work up the right flank. Copter 404 with Pilot Eggleston and Copter 404 Captain Podesta on board began making water drops on the right flank of the fire. They began their water drops at Lumsden Road and worked their way up the right flank towards the air tanker drops. Copter 404 did not make any water drops on the fire below Lumsden Road (between the road and river).

Incident Commander's Actions

STF Division Chief Johnson, was dispatched to the fire to be the Incident Commander (IC) and responded down Lumsden Road from the Buck Meadows area. The IC drove past the walking Helitack Crew 404 en route to scout out the fire. The fire had spread above and below Lumsden Road. The road paralleled the river and the right flank of the fire below the road was backing very slowly into the wind. After observing the fire area near the right flank, he returned to where the helitack crew was walking along Lumsden Road near South Fork campground.

The IC did not announce any overall strategy or priorities to the resources on the fire.

HC Winger met with IC Johnson on the road. Johnson did not identify himself as the IC, nor did Captain Winger inquire as to Johnson's role. IC Johnson told HC Winger that he had just driven to the right flank and described the fire situation that he had observed. IC Johnson said he gave HC Winger the strategic assignment to "size things up to see if there was some place they could safely anchor the fire and start doing some action." HC Winger stated that he understood his instructions to be to "anchor this fire on the right flank, the road down to the river." No specific tactics were discussed. Following the briefing, HC Winger and the crew continued to walk along Lumsden Road to the right flank of the fire. HC Winger still did not realize that Johnson was the IC.

After the briefing with Helitack Crew 404, IC Johnson initiated a discussion with ATGS Ward on the tactical net. IC Johnson asked ATGS Ward "as far as that helicopter goes, what do you think about using it to pick up that fire below the road so we can get that at least anchored up." ATGS Ward stated that he wasn't worried about the fire below the road and that the priority was further up the right flank. IC Johnson accepted ATGS Ward's recommendation that the fire below the road was not a priority and stated "the helitack crew is working their way up there; I think they are going to see if they can anchor that piece below the road." HC Winger heard this discussion on the tactical net, realized that Johnson was the IC and that the priority for Copter 404 was going to be above the road. Captain Winger said that he thought, "Oh, there goes our water drops."

Simultaneous to this portion of the discussion ATGS Ward's attention was distracted by the Air Attack 440 pilot on aircraft intercom about a new spot fire on the left flank and ATGS Ward did not hear the entire discussion about the helitack crew working below the road. ATGS Ward later stated that he thought Helitack Crew 404 was working above Lumsden Road.

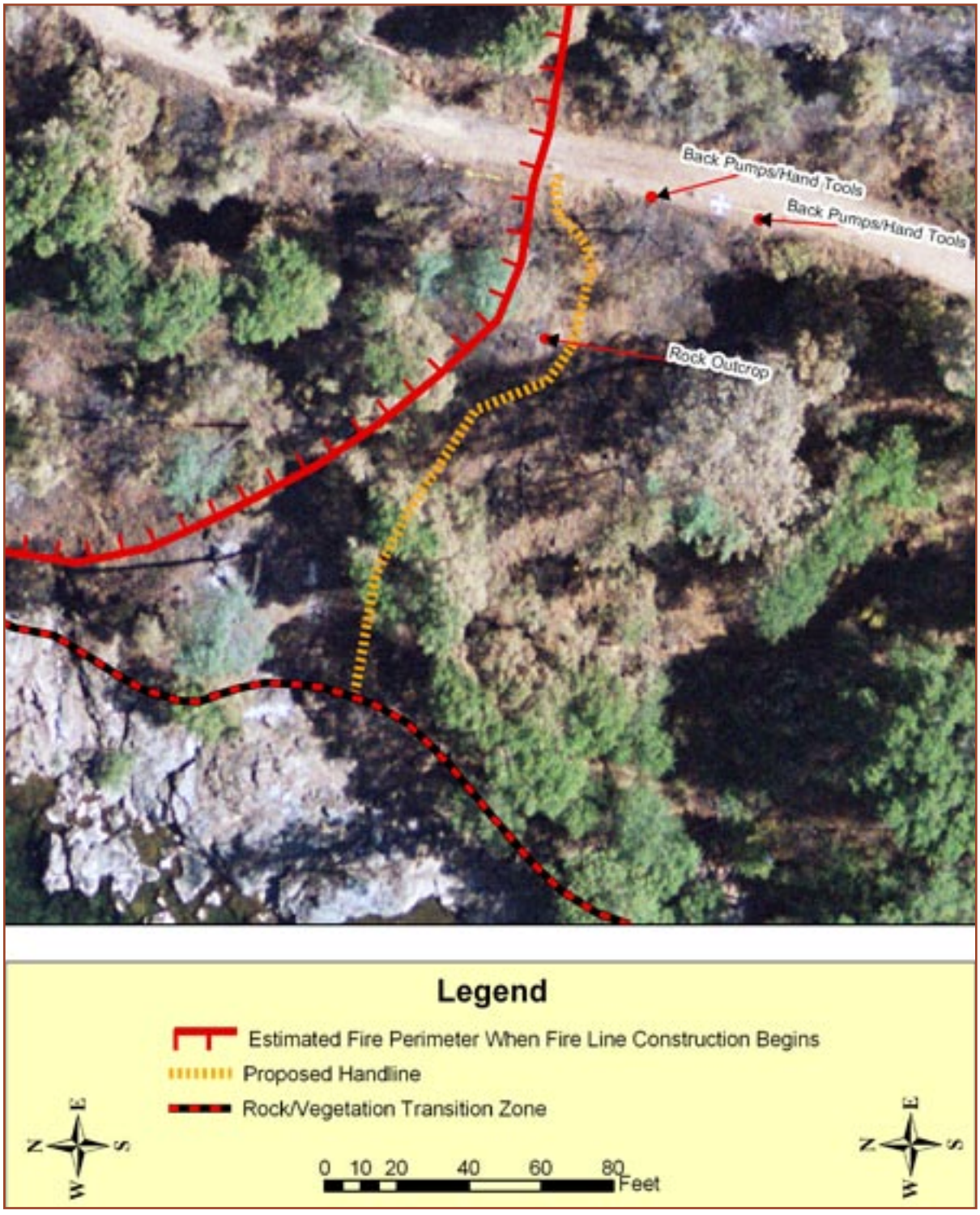
CDF Helitack Crew 404 Initial Actions at the Right Flank

At approximately 1335 hours, upon reaching the right flank, FF Boatman and FF Neveau scouted further up Lumsden Road to see how far they were from Lumsden Bridge. Their intent was to determine if they could access the river and work their way into the bottom of the fire. After their initial scouting they thought the bridge was another one to two miles further up river and would not work. The slope between the road and the river was very steep (80-120%). They observed that the further upstream they went, the steeper the slope to the river became. Smoke obscured visibility in the burn and they did not locate a way through the black to the river. They returned to the right flank of the fire and rejoined the crew.

HC Winger scouted out a grassy opening in the oak overstory near the fire's right flank where he could see to the river. The fuel type was grass, leaf litter and scattered light brush under an oak and pine overstory. He scouted down the right flank (about 70 feet) to a point where he could see the route for line construction to the high water mark of the river. HC Winger estimated this would require 250 to 300 feet of fireline to be constructed from the road to the rocks above the river.

The right flank of the fire, below the road, was generally backing slowly cross-slope into a steady, light up-canyon wind with surface flame lengths of 6 to 12 inches. The firefighters observed the fire burning underneath the scattered brush without igniting the aerial portion of the brush. *[Note: physical examination of the site indicated that scattered torching of individual brush had taken place.]* The fire edge did not go directly downhill; it angled down the slope and up the river and would

require constructing underslung line if they went direct. HC Winger made the determination that constructing a scratch line from the road downhill to the river would be simple and quick to accomplish. His plan was to construct indirect line parallel to the fire edge and then cut off the underslung portion by dropping straight down to the river and firing out the intervening fuel.



Planned fire line construction.

STF Engine 43 Actions

While HC Winger and Helitack Crew 404 scouted and assessed their tactics for the right flank of the fire; STF Engine 43 arrived at IC Johnson's location on Lumsden Road near South Fork Campground. STF E-43 Captain Mount received a briefing from IC Johnson and instructions to spot their engine at the Drew Creek crossing and support the helitack crew on the right flank. After the briefing, STF E-43 proceeded toward the right flank on Lumsden Road and parked at Drew Creek crossing. At 1342 hours, as Captain Mount started walking towards the right flank, STF E-43 broadcast "at scene" to STF Dispatch on Command Net. STF E-43 Captain Mount and STF E-43 FF Austin walked from the engine up Lumsden Road. Helitack Crew 404 was around a curve in the road and not visible from their parking spot. Neither IC Johnson, nor STF E-43 Captain Mount notified HC Winger that the engine was in the area or assigned to support them. HC Winger did not know an engine had been assigned to support his operation and that it was close.

Helitack Crew 404 Captain Winger's tactical briefing with crew

The tactic selected to establish the anchor at the river was indirect downhill fireline construction to stay out of heat and smoke and to take advantage of sparse fuel and natural barriers. The five backpack pumps were staged on the edge of the road. The crew began using one chainsaw and hand tools to construct line downhill from the road to the rocks above the river (slope distance of 180 feet). The specific fireline construction assignment was to start with the chainsaw to take out the scattered brush, followed by anchoring at the road using scraping tools to cut a quick indirect scratch line, paralleling the fire's edge 7 to 30 feet away. They began to fire-out the intervening fuel as they went down the slope. This parallel attack[2] was chosen in order to "stay out of the smoke and heat and take advantage of the grassy opening."

All members of the helitack crew stated that they understood the assignment, had an opportunity to comment, raise concerns, or even veto the assignment if they believed it to be unsafe. No one raised concerns.

HC Winger identified the escape routes and safety zones as:

- "downhill to the river"
- "up hill to the road, then up the road into the burn or down the road into the green"
- The standard safety zone of stepping into the burn was not specifically discussed, but crew members stated that they know it is always a primary option.

HC Winger notified Copter 404 Captain Podesta on the tactical net that they would be constructing downhill line on the right flank to tie into the river.

Tool order and assignments:

FF Fraser - chainsaw

FF Agustin - pulling and swamping for the saw

HC Winger - scraping tool and portable radio

FF Andahl - scraping tool

FF Schicke - scraping tool

FF Boatman - scraping tool

FF Neveau -scraping tool, portable radio and fusees

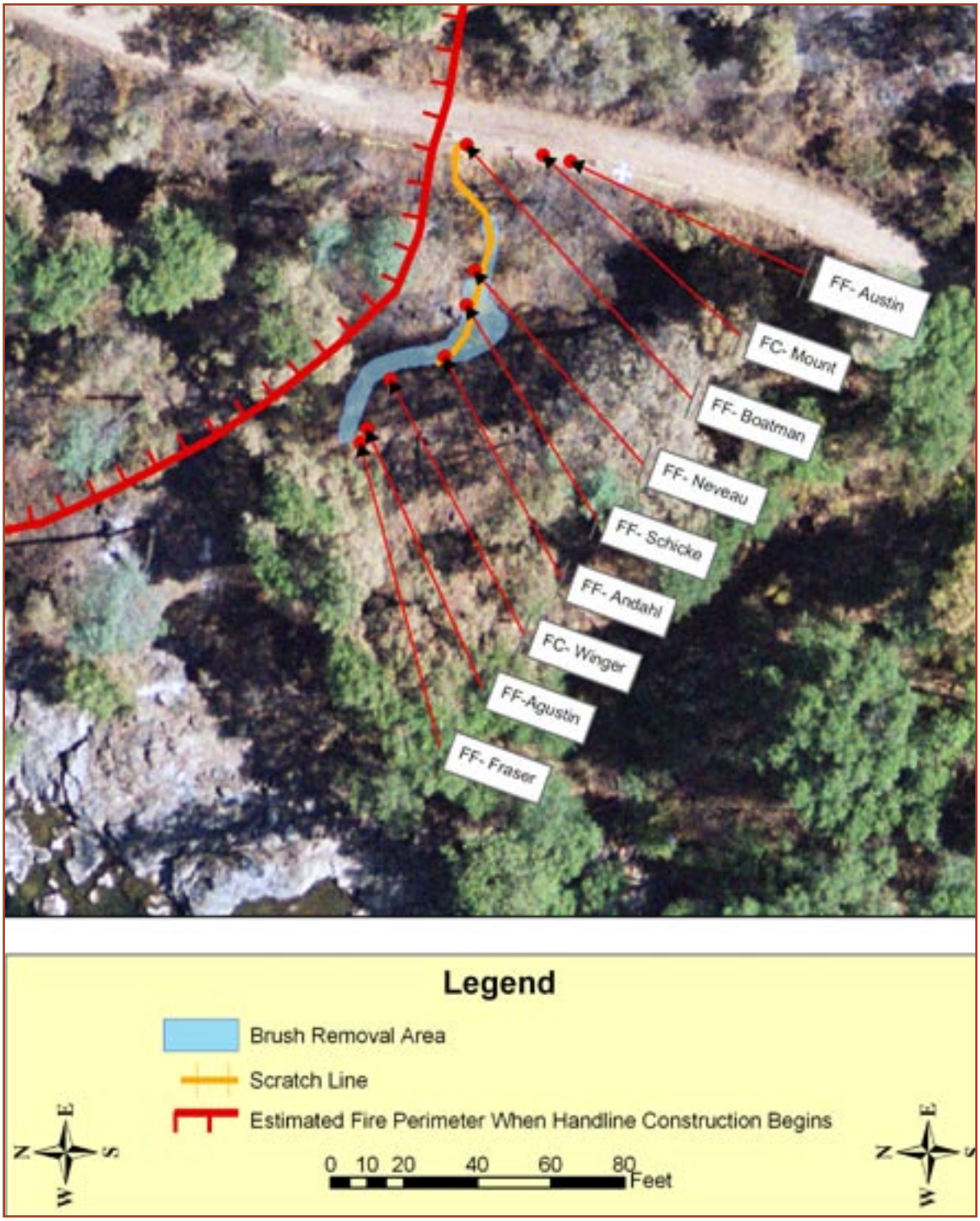
[2] CDF Manual section 4320.1 student information

CDF Helitack Crew 404 Fireline Construction

At approximately 1340 hours the crew members began building handline downhill through a 30- to 50-foot wide "grassy opening" with scattered brush fuels under an oak and pine overstory. They used the chainsaw and hand tools. The fire was backing into a steady 3 to 5 mph up-canyon wind towards the crew. FF Fraser and FF Agustin had reached a point approximately 2/3 of the way down the slope (roughly 30 feet above the rocks at the high water level of the river) and were running out of brush to cut. They moved very quickly since there was only scattered brush. The cut brush was thrown into the green, creating a brush-free zone for line construction. HC Winger and FF Andahl had cut a scratch line below a rocky outcropping, 80 to 100 feet down-slope from the road. FF Schicke and FF Boatman were improving the scratch line and FF Neveau was using a fusee to burn out the intervening fuel starting at the road. FF Neveau had fired from the road to FF Schicke's position, 25 to 35 feet below the road. According to their observations, the firing operation was "pulling into the fire's edge nicely."

Fire line construction prior to flareup.

Firefighters then observed what they described as a "minor" flutter in the wind. According to statements made to interviewers, Captain Winger addressed the three upper firefighters (Schicke, Neveau, Boatman) to "grab the back pump and just make sure that holds as you go down; look for spots as you go; lookout." FF Boatman volunteered to take this assignment and returned up the fireline to the road, he did not hear HC Winger say to be a lookout.



Crew Location Prior to Flareup

Flareup and Burnover Sequence

At approximately 1346 hours, as FF Boatman was preparing to don the back pump, STF E-43 Captain Mount and STF E-43 FF Austin walked up to his location and asked where the Helitack Captain was. FF Boatman indicated down the hill and STF E-43 Captain Mount saw HC Winger's red helmet and the crew building line.

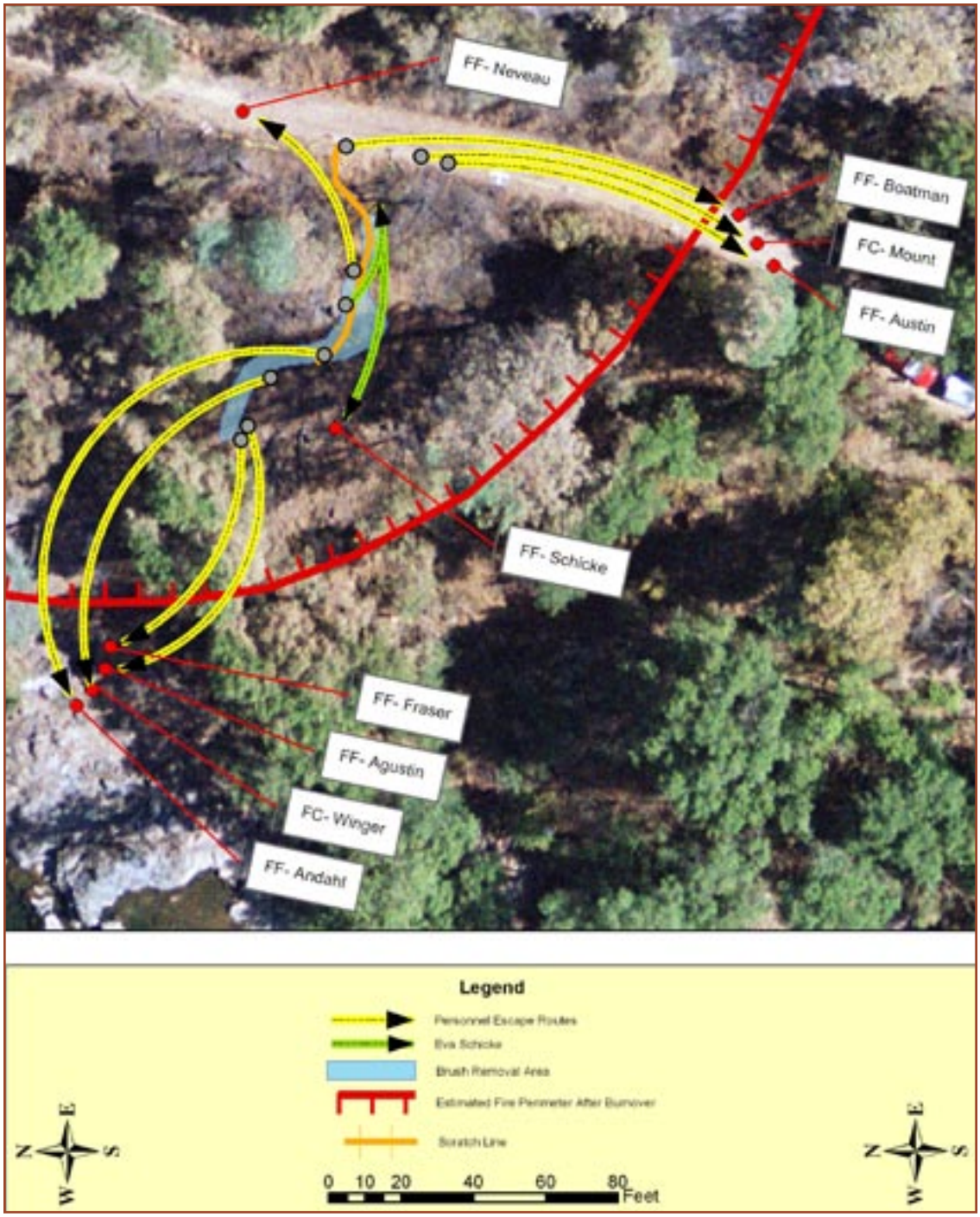
During this conversation, a sudden wind shift occurred causing the fire to change direction and spread up-slope into the crew. Three members of the helitack crew simultaneously shouted the alarm and everyone started toward their identified safety zones. Four members of the crew, including the captain, went down to the river; two went up toward Lumsden Road, FF Boatman was already on the road. The four firefighters that went downhill reached their safety zone. Of the two firefighters that went uphill, FF Schicke and FF Neveau, only FF Neveau made it to the road. FF Schicke was last seen by FF Neveau immediately behind him approximately 5 feet from the road. Firefighters at scene estimated the elapsed time from the wind shift to the burnover was less than 30 seconds with the total wind event lasting less than 2 minutes. There was no indication that the wind was going to change and dramatically as it did. It occurred suddenly without warning and the only action the crew could take was to react and seek safety zones. Fire shelters were not deployed.

[Note: the estimated elapsed time for this series of events to occur was the amount of time it took to read the preceding paragraph.]

The following actions occurred simultaneously

- The fire reacted to the directional wind shift and the backing fire became a spreading fire that turned up-slope with the wind. The fire rate-of-spread and flame lengths increased dramatically.
- FF Agustin saw the fire flareup "in a very small draw to the right of the oak tree we were cutting to and it sheeted up the draw in the grass." He yelled to FF Fraser (sawyer) to get down the hill; he and FF Fraser ran downhill towards the river safety zone. They skirted the flareup by running through the unburned fuels. They reached the river safely, without injury.
- HC Winger recognized the fire spreading toward the crew and yelled "emergency action."
- FF Neveau saw fire coming up the hill below him and yelled "wind shift;" fire began burning parallel to the fireline and his position.
- FF Andahl heard FF Neveau yell "wind shift" and saw fire below. FF Andahl was at the same location as Captain Winger; he and Captain Winger took separate routes side-hill through the flaming front. They both stated that it was very hot in the burn and did not believe they could stay there; both turned downhill towards the river. Due to the steepness of the slope their descent was almost uncontrolled; the last portion was almost vertical. FF Andahl bounced off of a tree, injured his ankle and received minor burns. Captain Winger suffered minor facial burns. Both made it to the river safety zone.
- While talking to FF Boatman, STF E-43 Captain Mount heard helitack crew members yelling and noticed a spot fire next to her on the cut bank on the uphill side of the road. STF E-43 Captain Mount started back towards STF E-43 and yelled for STF E-43 FF Austin to follow her. She observed the spot fire spreading parallel to Lumsden Road, down-canyon. The spot fire then turned up-slope. She felt a strong wind at her back as she "trotted" toward STF E-43.
- ATGS Ward observed an increase in fire intensity on the upper portion of the right flank (he estimated it to be at the 2,250 foot elevation) and a following flareup at the heel below the road. He gave an order over the tactical net for all crews to "get in the black, get to your safety zones." ATGS Ward believed Helitack Crew 404 was working above the road.
- FF Boatman saw the flareup below the crew and yelled at FF Neveau and FF Schicke to run uphill to the road. They were approximately 25 to 35 feet below the road. Both started up the fireline toward the road, hiking at first, then scrambling. They used their scraping tools, like a climbing tool, to help themselves up the slope.
- FF Boatman observed FF Schicke and FF Neveau scrambling up the hill towards him; then saw flame and felt intense heat coming up from just below the road. He was forced to back away from the edge and heard FF Schicke scream.

- FF Neveau scrambled up the fireline towards Lumsden Road. He looked over his shoulder and saw FF Schicke scrambling directly behind him. He felt intense heat coming from below and thought he was starting to burn. FF Neveau heard FF Schicke screaming. He last saw FF Schicke when they were within 5 to 10 feet of the road. This was the last time FF Schicke was seen alive.
- As the flames hit the road FF Neveau rolled over the lip of the road within the oncoming flame front and rolled across to the cut bank. FF Neveau moved up Lumsden Road into the black, out of the heat. He suffered smoke inhalation and thought he was burned.
- FF Boatman saw FF Neveau roll onto the road. He then lost visibility due to fire and smoke impinging on the road. He did not see FF Schicke come up onto the road and no longer heard her screaming. He moved down Lumsden Road into the green, out of the heat.



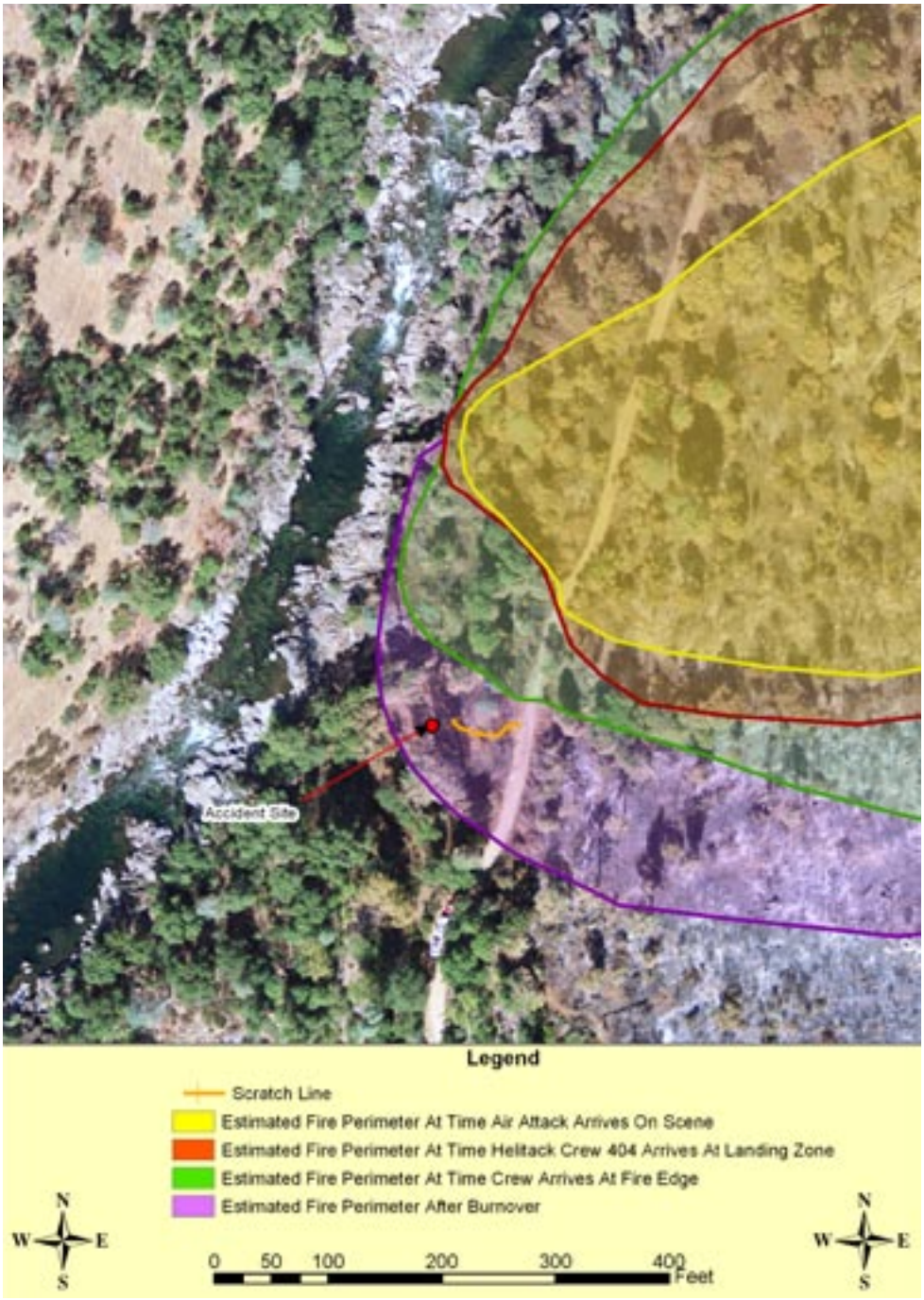
Post Flareup Personnel Locations

Post-Entrapment

Immediately following the flareup and escape to the safety zones, HC Winger announced over the tactical net that Helitack Crew 404 had been burned over and there were injuries. HC Winger asked ATGS Ward for immediate assistance with water drops.

- FF Boatman returned to FF Neveau's location and checked him for injuries.
- HC Winger identified FF Andahl, FF Agustin and FF Fraser along the river and contacted FF Neveau by radio to do a crew accountability check.
- FF Neveau contacted HC Winger on portable radio and stated that FF Boatman and FF Neveau were accounted for but FF Schicke was missing.
- FF Boatman walked back to the beginning of the fireline looking for FF Schicke but due to smoke couldn't see into the burn area.
- Copter 404 Captain Podesta heard HC Winger's emergency announcement on the tactical net. Copter 404 was working a spot fire on the left flank at the time of the emergency call; they left the spot fire and proceeded towards Helitack Crew 404. En route they picked up a load of water from a dipping spot near Lumsden Bridge. When they arrived at the crew's location, the fire had returned to a backing fire with minimal activity like they had seen earlier. They made water drops to cool off the area.
- At 1349 hours ATGS Ward requested two ground ambulances through STF Dispatch.
- HC Winger broadcast on the tactical net that there was a missing helitack crew member.
- At 1354 hours IC Johnson advised STF Dispatch there were injuries to firefighters on the line and one was missing
- Searches for FF Schicke were started from the river up and from the road down. Rolling rocks and other material in the burn hampered the search. There was concern that rolling rocks could injure the searchers near the river.
- FF Boatman and FF Neveau organized a grid search from the road with the assistance of STF Engine 43. FF Boatman and FF Neveau located FF Schicke's body approximately 80 feet below the road. HC Winger observed her body and determined that she was obviously deceased.
- HC Winger broadcast over the tactical net that the missing firefighter had been found. He did not say there was a fatality.
- At 1442 hours IC Johnson advised STF dispatch that the missing firefighter had been found.
- CDF Engines 4490 (Captain Yount) and 4476 (Engineer Craddock) arrived at the accident site and assisted in treating the injured crew members, including bringing FF Andahl up from the river. IC Johnson transported the surviving members of the crew to South Fork Campground. They were transported by Eldorado National Forest Copter 516 to Pine Mountain Airport near Groveland. FF Neveau was transported to Doctor's Hospital in Modesto via air ambulance. FF Andahl was transported to Sonora Regional Medical Center via air ambulance. The other crew members were transported to Sonora Regional Medical Center via ground ambulance.
- At 1500 hours initial attack IC Johnson transitioned incident command to Extended Attack IC Payne, STF Division Chief and met with STF Assistant Fire Management Officer (AFMO) McGowan. Initial Attack IC Johnson confirmed to STF AFMO McGowan that there was a fatality. STF AFMO McGowan called STF Fire Management Officer (FMO) Cones and confirmed the fatality.
- At 1615 hours STF AFMO McGowan and Initial Attack IC Johnson met with CDF Battalion Chief Henriques and CDF Fire Captain Jones to advise them of the fatal injuries to FF Schicke.
- At 1800 hours AFMO McGowan, Initial Attack IC Johnson and CDF Battalion Chief Henriques met with Tuolumne County Deputy Sheriff Crowe. Deputy Crowe advised that the recovery of FF Schicke's body would not take place until the next morning because of safety concerns for the recovery team.
- FF Neveau was admitted to Doctor's Hospital in Modesto, held overnight and released on September 13.

- HC Winger and the four firefighters taken to Sonora Regional Medical Center were treated and released by 1830 hours, September 12.
- Critical Incident Stress Debriefings occurred for personnel at Buck Meadows on September 12 and Sonora on September 13.



Detailed fire progression.

Personal Protective Equipment

All personnel had Personal Protective Equipment (PPE) that was proper for the assignment and the PPE performed as expected. PPE reduced the extent of injuries suffered and did not contribute to the accident.

Sequence of Events

Report approved by Board of Review May 11, 2005.

Sequence of Events in Chronological Order

Pre-Incident:

September 12, 2004

0800 hrs California Department of Forestry and Fire Protection (CDF) Battalion Chief (BC) Dan Ward reports for duty at the CDF Columbia Air Attack Base. BC Ward is working the last day of a four-day shift and has had an adequate work-rest cycle. Ward is assigned as the Air Tactical Group Supervisor (AGTS) on Air Attack 440 (Ward interview).

CDF Fire Captain (FC) Frank Podesta reports for duty at the CDF Columbia Air Attack Base. Copter 404 Captain Podesta is designated as the Copter 404 Captain. Copter 404 Captain Podesta is working the first day of a four-day shift and has had an adequate work-rest cycle (Podesta interview).

CDF Fire Captain (FC) Jonah Winger reports for duty at the CDF Columbia Air Attack Base. HC Winger is designated as the Helitack 404 Captain on Copter 404. HC Winger is working the first day of a four-day shift and has had an adequate work-rest cycle (Winger interview).

CDF Forestry Pilot (FP) Tom Eggleston reports for duty at the CDF Columbia Air Attack Base. FP Eggleston is assigned as the pilot for Copter 404. FP Eggleston is working the first day of his shift and has had an adequate work-rest cycle (Eggleston interview).

CDF Firefighter 1 (FF) Jeff Boatman reports for duty at the CDF Columbia Air Attack Base. FF Boatman is assigned as a crew member on Helitack crew 404. FF Boatman is working the first day of a four-day shift and has had an adequate work-rest cycle (Boatman interview).

CDF Firefighter 1 (FF) Shane Neveau reports for duty at the CDF Columbia Air Attack Base. FF Neveau is assigned as a crew member on Helitack Crew 404. FF Neveau is working the second day of a four-day shift and has had an adequate work-rest cycle (Neveau interview).

CDF Firefighter 1 (FF) Eva Schicke reports for duty at the CDF Columbia Air Attack Base. FF Schicke is assigned as a crew member on Helitack crew 404. FF Schicke is working the fourth day of a four-day shift and has had an adequate work-rest cycle (Ward 2nd interview).

CDF Firefighter 1 (FF) John Andahl reports for duty at the CDF Columbia Air Attack Base. FF Andahl is assigned as a crew member on Helitack crew 404. FF Andahl is working the fourth day of a four-day shift and has had an adequate work-rest cycle (Andahl interview).

CDF Firefighter 1 (FF) Josh Agustin reports for duty at the CDF Columbia Air Attack Base. FF Agustin is assigned as a crew member on Helitack Crew 404. FF Agustin is working the first day of a four-day shift and has had an adequate work-rest cycle (Agustin interview).

CDF Firefighter 1 (FF) T.J. Fraser reports for duty at the CDF Columbia Air Attack Base. FF Fraser is assigned as a crew member on Helitack Crew 404. FF Fraser is working the third day of a four-day shift and has had an adequate work-rest cycle (Fraser interview).

0900 hrs Copter 404 Captain Podesta, Helitack Captain (HC) Winger, FF Agustin, FF Andahl, FF Boatman, FF Fraser, FF Neveau and FF Schicke participate in physical fitness training at the Columbia Air Attack Base. No injuries are reported after this training (all crew interviews).

USFS Fire Management Officer (FMO) Allen Johnson reports for duty as the Groveland Ranger District Duty Officer. FMO Johnson, designated as STF Division 4, was off-duty the night before and slept all night (Johnson interview).

1030 hrs Copter 404 Captain Podesta, HC Winger, FF Andahl, FF Agustin, FF Boatman, FF Fraser, FF Neveau, FF Schicke eat breakfast (all crew interviews).

Incident:

1233 hrs Stanislaus National Forest (STF) Duckwall Lookout reports the Tuolumne Fire to Stanislaus Dispatch. The fire is originally reported near the Sweetwater Campground area, approximately 5 miles east of Buck Meadows. The fire is reported at Latitude 37 50.44.16 Longitude 120 1' 58.08. Section 19, Township 1S Range 18E. (Johnson interview & STF Computer Aided Dispatch [CAD] Report).

1245 hrs Stanislaus Dispatch initiates a wildland fire response and dispatches STF Division 4, CDF Battalion 4416, STF Engine 42 and Water Tender 42 from the Buck Meadows Fire Station, STF Engine 43 from the McDiarmid Fire Station, STF Engine 44 from the Cherry Lake Fire Station, CDF Engine 4490 and CDF Engine 4476 from the CDF Groveland Fire Station and E4468 from the CDF Green Springs Fire Station, Air Attack 440, Tanker 82, Tanker 83 and Helicopter 404 from Columbia Air Attack Base. (STF CAD report).

Copter 404, Air Attack 440, Air Tanker 82, Air Tanker 83 are dispatched to the fire from Columbia Air Attack Base. The interagency intercom is used to dispatch the Columbia aircraft. There is no communication between STF dispatch and the CDF air resources. (Tuolumne Calaveras Unit [TCU] MIRPS Report)

CDF Copter 404 responds to the Tuolumne Fire. On board are Forestry Pilot Tom Eggleston, Fire Captain Frank Podesta, Fire Captain Jonah Winger, Firefighter Josh Agustin, Firefighter John Andahl, Firefighter Jeff Boatman, Firefighter T.J. Fraser, Firefighter Shane Neveau, Firefighter Eva Schicke.

Air Attack 440 (AA440) responds to the Tuolumne Fire with Pilot Colin Rogers and CDF BC Dan Ward.

Airtanker (AT) 82 responds to the Tuolumne Fire with Pilot Duane Cornell.

Airtanker (AT) 83 responds to the Tuolumne Fire with Pilot Jim Dunn.

Smith Peak Lookout advises STF Division 4 Allen Johnson the fire looks closer to the confluence of the South Fork of the Tuolumne River and the main Tuolumne River.

1246 hrs STF Division 4 Johnson advises STF Dispatch on STF Forest Net the fire is in Tuolumne River Canyon, not the Sweetwater Campground Area. STF Division 4 Johnson begins his access down Lumsden Road toward the heel of the fire (Johnson interview, CAD report).

1255 hrs Copter 404 is flying toward the fire. The crew can see the fire is near the Tuolumne River. FF Boatman talks with the crew about Tuolumne River Canyon and his knowledge from river rafting the area. FF Boatman talks of the steep topography and long access times for vehicle traffic (Boatman interview).

1259 hrs AA 440 with BC Ward and pilot Rogers are at scene (STF CAD Report).

1303 hrs AA 440 BC Ward contacts STF Division 4 Johnson on STF Forest Net. ATGS Ward states the fire is burning 5-10 acres and the fire is on both sides of Lumsden Road (STF CAD report, AA 440 video).

CDF Airtanker 82 and Airtanker 83 are at scene (AA440 video).

1304 hrs Copter 404 arrives at scene and is directed by AA 440 to hold out of the area while the airtankers work the fire (AA440 video).

1305 hrs STF E-43 starts down Lumsden Road from Ferretti Road.

1306 hrs STF Division 4 Johnson assumes the role of Incident Commander (IC). IC Johnson directs CDF B4416 to have the CDF engines make access down Lumsden Road. IC Johnson orders an additional five type 3 engines, three additional helicopters and four additional airtankers (STF CAD report).

1310 hrs AA 440 assigns Airtanker 82 and 83 to drop fire retardant on the upper portion of the right flank (Ward interview).

First airtanker drop at lower portion of right flank, second drop working backwards up-slope (Cornell and Dunn interviews).

IC Johnson parks at South Fork Campground on Lumsden Road, approximately 1 mile west of the right flank of the fire. Johnson is able to see an airtanker drop on right flank (Johnson interview).

Copter 404 recons the fire and surrounding area for a safe landing zone (Podesta Interview).

1311 hrs Copter 404 locates a landing zone along the river, downstream from the fire. The landing zone is near the South Fork campground at the confluence of the main fork and south fork of the Tuolumne River. (AA440 Video)

Copter 404 lands at landing zone and deploys HC Winger, FF Agustin, FF Andahl, FF Boatman, FF Fraser, FF Neveau and FF Schicke. Copter 404 Captain Podesta and FP Eggleston remain in Copter 404. Copter 404 Captain Podesta and HC Winger discuss a plan to work Crew 404 on the right flank. HC Winger has a handi-talki and has it set to the designated tactical net (Forest Service Tac#2). HC Winger is also scanning CDF Air to Ground frequency. Crew 404 offloads five full five-gallon water backpack pumps, a chainsaw, a chainsaw support pack (including extra fuel and oil) and five scraping tools (Podesta and Winger interviews).

1312 hrs Crew 404 gathers on Lumsden Road near the South Fork Campground after individually hiking from Copter 404's landing zone. Crew 404 begins walking toward the right flank fireline on Lumsden Road (all crew 404 interviews).

AA 440 assigns Copter 404 to begin making water drops at the bottom of the right flank and work up toward the head of the fire.

1314 hrs IC Johnson requests six additional handcrews from STF Dispatch.

HC Winger uses his handi-talki to inform Copter 404 Captain Podesta that Crew 404 will work the right flank (Podesta and Winger interviews).

1316 hrs Copter 404 makes first bucket drop on fire starting at the lower portion of the right flank, above Lumsden Road (AA440 video).

Crew 404 is still hiking in (Podesta interview).

1319 hrs Copter 404 makes second water drop on right flank above Lumsden Road (AA 440 video).

1320 hrs IC Johnson arrives at scene on Lumsden Road. As IC Johnson drives past the South Fork Campground, he sees Crew 404 walking along Lumsden Road. IC Johnson is surprised to see the crew. Until this point IC Johnson thought he was the only resource on the ground. IC Johnson had not heard any radio traffic about Crew 404 or Copter 404 being at the scene. IC Johnson drives past Crew 404 while they are walking on Lumsden Road. IC Johnson drives to right flank to assess the fire (Johnson interview).

1322 hrs AA 440 relays to IC Johnson that fire intensity is beginning to increase.

1323 hrs Copter 404 makes 4th water drop on right flank above Lumsden Road (AA 440 Video).

IC Johnson observes fire burning on both sides of Lumsden Road. IC Johnson observes smoke conditions and only a smoldering fire below Lumsden Road. IC Johnson continues driving the burn area to assess the left flank. IC Johnson becomes concerned about rolling material or snags falling on Lumsden Road behind him. IC Johnson turns his vehicle around and drives back out the way he came on Lumsden Road (Johnson interview).

1325 hrs IC Johnson drives back downstream on Lumsden Road and meets with Crew 404. IC Johnson talks face-to-face with HC Winger and assigns crew 404 to the right flank. IC Johnson tells HC Winger the fire is burning in steep country, with fire on both sides of the road. IC Johnson instructs HC Winger to go in and size up the right flank and find a place to take action. IC Johnson does not instruct HC Winger to report back to him on his actions. IC Johnson drives to South Fork Campground to better view the fire (Johnson and Winger interviews).

IC Johnson asks AA 440 about using Copter 404 to make water drops on the bottom of the right flank below the road to anchor it. ATGS Ward replies he isn't worried about the bottom of the right flank; it is holding it's own. IC Johnson states Crew 404 is going to try to anchor the fire below the road (AA440 video).

AA 440 pilot sees spot on the left flank. Pilot Rogers and ATGS Ward have a discussion about the spot on the Air Attack 440 intercom. ATGS Ward tells IC Johnson about the spot. ATGS Ward focuses his attention to the spot fire on the left flank (AA 440 video).

Crew 404 is still hiking (Winger interview).

1328 hrs Copter 404 makes 5th bucket drop on right flank above Lumsden Road (AA440 video).

1330 hrs Copter 404 makes 6th bucket drop on right flank above Lumsden Road (AA440 video).

1331 hrs Airtanker drops on right flank (AA440 Video).

Copter 404 offers to check out spot fire on left flank (Ward Interview).

Crew 404 continues hiking on Lumsden Road toward right flank (Winger interviews).

1335 hrs Crew 404 arrives at right flank. FF Boatman and FF Neveau scout further east on Lumsden Road to verify their position in relation to the Lumsden Bridge. FF Boatman also checks for access downhill from Lumsden Road to the river area (Boatman and Neveau interviews).

FF Boatman and FF Neveau do not locate an access point and return to where HC Winger and Crew 404 are positioned. HC Winger briefs crew on possibly constructing handline downhill to river from Lumsden Road. HC Winger scouts area by hiking downhill toward river. HC Winger estimates the distance to tie in the road to the river to be 300 feet. *[Actual measurement at the scene was 260'.]* HC Winger locates a break in the fuel bed estimated by him to be 7 to 15 feet from the fire's edge. HC Winger describes the fire as backing cross-slope, with low flame lengths (approximately 6 to 12 inches). HC Winger decides this is the best area to construct indirect handline to stay out of the heat and heavier brush. HC Winger identifies the safety zones as back up the hill to Lumsden Road then east along the road into the black, or down the hill to the river, where there is no fuel. HC Winger chooses this indirect tactic to stay out of the heat and smoke, take advantage of light fuels and to not have to deploy the heavy back pumps on a steep slope (Winger interview).

HC Winger finishes briefing crew on the assignment. All crew members are polled on any concerns over the assignment. No safety concerns are voiced. HC Winger directs Crew 404 to stage the full water back pumps along Lumsden Road. HC Winger does not deploy the back pumps because of the indirect tactic that he chose. The chainsaw and scraping tools are the only tools initially deployed for indirect handline construction. HC Winger employs the indirect tactic based on the break in the fuel bed, presence of a smoldering or backing fire and the fast time frame he expects to complete this assignment (all crew 404 interviews).

HC Winger advises Copter 404 that the Helitack Crew would be building downhill fireline from the road to the river on the right flank. Copter 404 Captain Podesta is the only person that hears this traffic. Copter 404 monitoring CDF Air to Ground and assigned tactical net (Eggleston interview).

IC Johnson does not hear this traffic (Johnson interview).

HC Winger's communication to Copter 404 was on tactical net (Podesta interview).

1340 hrs

STF E-43 arrives at the South Fork Campground and meets with IC Johnson. STF E-43 Captain Mount meets with IC Johnson. IC Johnson tells E-43 Captain Mount "Helitack Crew 404 is hiking in and should be at the fireline by now." IC Johnson states Crew 404 is assessing the fire to see if they can start flanking the fire. IC Johnson assigns E-43 to the right flank. The instructions from IC Johnson include, find a safe place to spot the engine, support Crew 404 and assess the right flank to see if there is anything the rest of the responding engines can do. IC Johnson specifically tells STF E-43 Captain Mount about the turnout along Lumsden Road at Drew Creek. This is the turnout STF E-43 Captain Mount decides to initially spot STF E-43 (Mount and Johnson interviews).

Crew 404 descends from Lumsden Road downhill in the following order:

– FF Fraser is assigned to begin constructing handline using a chainsaw to clear what little brush there was. FF Agustin is assigned to be the swamper for the saw. FF Fraser and FF Agustin begin line construction from Lumsden Road. FF Fraser and FF Agustin move fairly quickly due to the limited amount of brush (Winger interview).

– HC Winger begins constructing handline from Lumsden Road. Winger is working both as a scout and using a scraping tool (Winger interview).

– FF Andahl is assigned a scraping tool and begins constructing handline from Lumsden Road (Andahl interview).

– FF Schicke is assigned a scraping tool and begins constructing handline from Lumsden Road (Boatman interview).

– FF Boatman is assigned a scraping tool and begins constructing handline from Lumsden Road (Boatman interview).

1342 hrs STF E-43 arrives at Lumsden Road at the turnout at Drew Creek, just west of where Crew 404 is working. E-43 stops at this location to allow E-43 Captain Mount to walk ahead and determine if there is a safe area for the engine to park in. E-43 advises STF Dispatch they are at scene (Mount interview).

FF Neveau is assigned a scraping tool and a handi-talki monitoring the assigned tactical net. FF Neveau begins fireline construction from Lumsden Road. FF Neveau is monitoring the tactical net only. The bank that is selected does not allow FF Neveau to monitor air to ground (Neveau and Boatman interviews).

1344 hrs HC Winger directs FF Neveau to burn-out the fuel between the fire's edge and the fireline the crew is constructing (Winger and Neveau interviews).

FF Neveau begins firing from road using a fusee. Neveau fires down approximately 25 feet to FF Schicke. FF Neveau stops firing at FF Schicke's position (Neveau interview).

STF E-43 Captain Mount and FF Austin walk up Lumsden Road to the area of the right flank (Mount interview).

1345 hrs Fire intensity picks up on ridge at right flank above the road and above Crew 404. ATGS Ward noticed a flareup at the heel a few moments later (Ward interview #2).

Crew 404 continues handline construction unaware of the change above the road. The area above the road was not visible from their location (Winger interview).

HC Winger gives direction to FF Schicke, FF Boatman and FF Neveau to deploy a back pack pump to hold any slop over and to have a good visible perspective on the crew. FF Boatmen accepts this assignment and hikes up to Lumsden Road (Winger and Boatman interviews).

FF Boatman arrives at the cache of backpumps.

STF E-43 Captain Mount contacts FF Boatman and asks where his captain is. STF E-43 Captain Mount sees a crew person wearing a red helmet down the handline from Lumsden Road. STF E-43 Captain Mount discusses the line construction with FF Boatman. STF E-43 Captain Mount states to FF Austin she would not commit E-43 to that line because of the steepness (Austin statement).

Simultaneously the members of Crew 404 notice the fire flareup below them (all Crew 404 interviews).

1346 hrs FF Neveau sees flareup below him, at the bottom of the hill and yells "wind change." Wind begins blowing up-slope toward Crew 404 (FF Neveau interview).

FF Agustin sees fire flareup below him. FF Agustin yells at FF Fraser to get down the hill (Agustin interview).

FF Fraser hears FF Agustin and begins running downhill (Fraser interview).

HC Winger recognizes the fire spreading toward Crew 404 from below and yells "Emergency Action" (Winger interview).

STF E-43 Captain Mount hears Crew 404 begin yelling while talking to FF Boatman. STF E-43 Captain Mount turns toward the cut bank across Lumsden Road and sees a small circular spot of fire burning at the bottom of the cut bank (Mount interview).

FF Andahl hears FF Neveau yell "wind change" and sees fire below. FF Andahl is with HC Winger. FF Andahl begins running downhill. FF Andahl and HC Winger are approximately 80–100 feet below Lumsden Road at a rocky outcropping (Andahl interview).

HC Winger begins running downhill. HC Winger is cut off by the advancing head fire and changes direction to running across the slope into the burn. The burn is hot and HC Winger is exposed to heat and smoke (Winger interview).

FF Andahl is cut off by the advancing head fire and changes direction to across the slope. FF Andahl runs down an extremely steep slope. This causes him to fall and roll uncontrolled down the hill. FF Andahl stops when he lands on his back on the rocky edge of the river (Andahl interview).

STF E-43 Captain Mount starts walking back toward STF E-43. Mount yells for FF Austin to follow her. FF Austin is standing near FF Boatman. FC Mount observes the small spot spread parallel to Lumsden Road and down-canyon toward E-43's location. The spot fire also increases in rate of spread and intensity (Mount interview).

1346 hrs ATGS Ward observes an increase in fire intensity on the upper portion of the right flank, at approximately 2250' elevation. ATGS Ward sees flareup at heel of right flank and gives the order over the tactical net for all crews to "get in the black, get to your safety zones." ATGS Ward believes Crew 404 is working above Lumsden Road. (Ward interview #1 and #2).

CDF E4490 and E4476 are driving down Lumsden Road, west of the South Fork Campground. FC John Yount is driving E4490 and Fire Apparatus Engineer (FAE) Kevin Craddock is driving E4476. FAE Craddock hears the order from ATGS Ward to "get in your safety zones" on the radio. Craddock believes he is monitoring the assigned tactical frequency (Craddock interview).

FF Boatman sees flareup below Crew 404 and yells at FF Neveau and FF Schicke to run uphill to the road. FF Boatman observes FF Neveau and FF Schicke running uphill. Both FF Neveau and FF Schicke have their scraping tool in their right hand and still have their backpack/web gear on (Boatman interview).

FF Neveau sees fire coming uphill and begins running uphill with FF Schicke "right on my heels." FF Neveau estimates they are less than 10 feet from Lumsden Road (Neveau interview).

FF Boatman sees fire coming up from below and backs up from road edge. FF Boatman hears FF Schicke scream (Boatman interview).

FF Neveau is running up the fireline toward Lumsden Road and, by looking over his shoulder, sees FF Schicke directly behind him. FF Neveau can feel heat coming from below. FF Neveau is screaming and can hear FF Schicke screaming. FF Neveau can see FF Schicke using her hand tool to assist her hiking up the hill. FF Schicke is last seen within five feet of Lumsden Road. The loud roar of the approaching fire makes hearing difficult. This is the last time FF Neveau hears FF Schicke screaming (Neveau interview).

FF Boatman sees FF Neveau roll up onto Lumsden Road. The fire is burning directly over FF Neveau. FF Neveau rolls across Lumsden Road to bottom of the cut bank. FF Boatman loses visibility because of fire and smoke. FF Boatman does not hear FF Schicke screaming anymore and doesn't see her make it to the road (Boatman interview).

FF Boatman retreats down Lumsden Road toward STF E-43 with FF Austin (Boatman interview).

FF Agustin and FF Fraser escape down to river (Agustin and Fraser interview).

FF Andahl hikes down to river with minor burns, but during the run he thought he broke his ankle (Andahl interview).

HC Winger makes it to river with minor burns. HC Winger contacts ATGS Ward on the tactical frequency. HC Winger advises Crew 404 has been burned over and there are injuries. HC Winger asks for immediate assistance with water drops (Winger interview).

Copter 404 Captain Podesta hears HC Winger on tactical net requesting the water drops and assistance (Podesta interview).

1349 hrs AA440 orders two ground ambulances through Stanislaus Dispatch (CAD Report).

FF Boatman retreats west on Lumsden Road toward STF E-43 with FC Mount and FF Austin. E-43 is parked at the Drew Creek turn out, down stream from burnover site (Boatman and Austin interviews).

FF Neveau moves east on Lumsden Road into the previously burned area. FF Neveau suffers minor burns and smoke inhalation (Neveau interview).

Copter 404 leaves spot fire on left flank and proceeds toward Crew 404. The dipping site is upstream from Lumsden Bridge. Copter 404 has to pick up water before responding to site where Crew 404 is located (Eggleston, Ward and Podesta interviews).

FF Boatman returns to the burn area and meets with FF Neveau. FF Neveau asks FF Boatman, "Am I burned?" FF Boatman tells FF Neveau he is "a little red." FF Neveau contacts HC Winger by radio and completes a crew count. FF Neveau advises FF Schicke is missing (Boatman and Neveau interviews).

FF Boatman walks back to the fireline looking for FF Schicke. FF Boatman can't see into the burn area because of the smoke. FF Boatman and FF Neveau are yelling for FF Schicke (Boatman interview).

1353 hrs CDF E4490 and E4476 arrive at South Fork Campground and are assigned by IC Johnson to stage there (Johnson and Craddock interviews).

FF Agustin and FF Fraser assist FF Andahl to the edge of the river (Andahl interview).

Copter 404 fills its bucket at the river and arrives at the bottom of the right flank. Pilot Eggleston sees minimal fire activity at right heel. Copter 404 begins making water drops (Eggleston interview).

HC Winger broadcasts on the tactical net that there is a missing crew member (Winger interview).

ATGS Ward estimates flareup behavior lasts approximately 30 seconds (Ward interview #1).

The fire quickly returns to previous backing behavior (Ward interview #1).

FF Fraser estimates flareup lasts approximately 8 seconds (Fraser interview).

FF Neveau estimates the flareup lasts approximately 10 seconds (Neveau interview).

1354 hrs IC Johnson advises Stanislaus Dispatch there are injuries to firefighters on the fire and one firefighter in missing. Requests two ambulances to the Lumsden Bridge Area (STF Cad Report).

FF Agustin begins looking downstream, upstream and in the green for FF Schicke (Agustin interview).

FF Andahl is located near the river. FF Andahl begins feeling weak. FF Andahl tells FF Fraser "I think I'm going to pass out." FF Fraser instructs FF Andahl to cool himself off with the river water (Andahl interview).

FF Fraser and HC Winger begin looking in the burn area at the bottom of the fire near the river for FF Schicke. Rolling rocks and other material hamper search (Winger and Fraser interviews).

HC Winger tells Copter 404 to drop in the burn area to cool it down (Winger and Podesta interviews).

HC Winger contacts AA440 and requests assistance to conduct grid search of area (Winger interview).

CDF E4490 and E4476 ask IC for permission to proceed into burnover area to assist with search. IC Johnson advises to proceed into the area if it is safe (Craddock interview).

E-43 Captain Mount instructs the driver of STF E-43 to back the engine into the burn area near the location of Crew 404's handline construction start point (Mount interview).

FF Boatman walks down the handline looking for FF Schicke. FF Boatman locates FF Schicke's handtool approximately 40' down from the road. Boatman picks up the hand tool and uses it to assist himself back up the slope. FF Boatman does not see FF Schicke. Burn area is still hot and smoky (Boatman interview).

FF Fraser begins search uphill from river (Fraser interview).

FF Boatman begins to organize a grid search from the top, but delays because of the search coming up from the bottom. FF Boatman determines there is too much risk of increasing the amount of rolling material going down the hill. This would be dangerous for the firefighters coming up from the bottom (Boatman interview).

FF Fraser arrives at the top of the road and meets with FF Boatman and FF Neveau (Boatman interview).

FF Boatman organizes a grid search with STF Engine 43, FF Fraser and FF Neveau (Boatman interview).

FF Boatman and FF Neveau locate FF Schicke mid-slope from the road. FF Boatman points out FF Schicke to HC Winger, who has worked his way up from the bottom (Boatman, Neveau and Winger interviews).

HC Winger determines FF Schicke is obviously deceased (Winger interview).

HC Winger, FF Boatman, FF Fraser, FF Neveau and the crew from STF E-43 move back to road (Boatman interview).

HC Winger broadcasts over the radio that the missing firefighter has been found. HC Winger does not say there is a fatality (Winger interviews).

1442 hrs IC Johnson advises Stanislaus Dispatch the missing firefighter has been found (CAD Report).

E4490 and E4476 arrive at the accident scene. E4476 FAE Craddock assists FF Andahl up from the slope (Craddock interview).

Crew 404 (HC Winger, FF Agustin, FF Andahl, FF Boatman, FF Fraser and FF Neveau) assemble on the road.

FF Neveau begins having difficulty breathing (Boatman interview).

HC Winger, FF Agustin, FF Andahl, FF Boatman, FF Fraser and FF Neveau and are transported by IC Johnson to South Fork Campground (Boatman, Neveau, Winger and Johnson interviews).

1500 hrs STF Division 3, Jon Payne, arrives at scene. Payne is the Fire Management Officer from the Summit Ranger District. IC Johnson transitions command to Payne. Chief Payne responded to the fire as an additional chief officer (CAD Report).

1506 hrs HC Winger, FF Agustin, FF Andahl, FF Boatman, FF Fraser and FF Neveau are transported by USFS Copter 516 to Pine Mountain Airport to meet the air ambulance (CAD Report).

FF Neveau is transported by Air Ambulance to Doctors Hospital in Modesto (CAD Report).

FF Andahl is transported by separate air ambulance to Sonora Regional Medical Center (CAD Report).

HC Winger, FF Agustin, FF Boatman and FF Fraser are transported by ground ambulance to Sonora Regional Medical Center [SRMC] (CAD Report).

1515 hrs Assistant Fire Management Officer Jerry McGowan meets with STF Division 4 Johnson. STF Division 4 Johnson confirms there is a fatality. McGowan calls STF Fire Management Officer Gary Cones and notifies him of the fatality (McGowan Statement).

1516 hrs One ground ambulance transports HC Winger, FF Agustin, FF Boatman and FF Fraser to SRMC (TCSO CAD).

1611 hrs Ground ambulance arrives at SRMC. (TCSO CAD).

Post Incident:

1615 hrs STF AFMO McGowan and STF Div 4 Johnson meet with CDF Battalion Chief Julie Henriques and CDF Fire Captain Rommie Jones and confirm the fatality. All parties decide to drive down to the site of the flareup to confirm the fatality. AFMO McGowan meets up with USFS LEO Jim Moriarty. LEO Moriarty is coming from the accident site and also confirms a fatality has occurred (McGowan statement).

1630 hrs CDF Safety Officer Kirk McBride arrived at Sonora Regional Medical Center. CDF Safety Officer McBride initiates a defusing process with Helitack Crew 404.

1718 hrs FF Boatman is released from SRMC.

1724 hrs FF Fraser is released from SRMC.

1730 hrs FF Agustin is released from SRMC.

1800 hrs STF AFMO McGowan, STF Div 4 Johnson and CDF BC Henriques meet with Sheriff's Deputy Dan Crowe. Crowe advises the recovery of FF Schicke's body will not take place until the morning because of safety concerns.

1820 hrs HC Winger is released from SRMC.

1830 hrs FF Andahl is released from SRMC.

2100 hrs STF AFMO McGowan takes STF Div 4 Johnson home to his residence. Johnson goes off duty.

September 13, 2004

0900 hrs Critical Incident Stress Debriefing (CISD) process begins at the Best Western Sonora Oaks Hotel. CISD contacts continue for the duration of the investigation.

0900 hrs A joint CDF/USFS accident investigation team convenes at the Stanislaus National Forest Supervisor's Office in Sonora.

1506 hrs FF Neveau is released from Doctors Medical Center in Modesto.

FF Schicke's body is recovered by TCSO search and rescue team. The body is transported to Sonora.

1600 hrs Accident investigation team arrives at accident site. Team members examine the site and speak with the USFS investigators.

September 14, 2004

Accident investigation team commences investigation process.

Findings

Report approved by Board of Review May 11, 2005.

Findings

This section presents the CDF Helitack 404 Crew Burnover Investigation Team's findings. A finding is a conclusion drawn from and supported by interviews, witness statements and physical evidence found elsewhere in the document.

Fire Behavior

Fuels

- Primary fuels burning at the accident site were light flashy surface fuels consisting of oak leaf and pine needle litter, sparse short discontinuous cured annual grass and mixed brush with an oak and pine overstory.
- Fuel remains and burn indicators in the area of the accident site are consistent with a low-intensity backing fire.
- One-hour fine dead fuel moisture was calculated at 4-5 percent for exposed fuels and 6-7 percent for shaded fuels.
- 1,000-hour fuel moisture was at a 33-year record minimum value of 7 percent at nearby Buck Meadows RAWS station.
- On-site live fuel moisture samples were taken on 9/17/04. The values recorded are for manzanita (71%) and chamise (61%).
- Energy release component (ERC) for 09/12/04 was at a record maximum value of 86.

Photo 3. Surface fuels similar to those in which the fire was burning.

Weather

- Weather observations at the fire area were not recorded prior to the burnover.
- Estimated weather values were: temp. 89-94 F, relative humidity 18-24 percent, winds WSW 3-5 mph.
- A spot weather forecast had not been requested for the incident during the initial attack stages.
- There was a sudden and unanticipated wind shift of 90-120 degrees at the accident site.
- No unusual or critical fire weather patterns (thunderstorms, frontal passage, etc.) were in place or predicted for the fire area.

Topography

- At the time of initial attack, near the accident, the fire was backing laterally on a west aspect, with slopes ranging from 80-120 percent. The main fire was spreading to the southeast toward Drew Meadow.
- At the time of initial attack, the backing fire had not yet progressed completely down-slope to the Tuolumne River.
- When the wind shift occurred, the fire transitioned to 90 percent uphill slopes.

Tuolumne River, fire origin, accident site. Lumsden Bridge is at top of photo.

Predicted Versus Observed Fire Behavior

Predicted:

- There was no unusual or critical fire weather predicted for the Tuolumne fire area on 09/12/04.
- Fire weather forecasts were available and were broadcast 09/12/04 on CDF and USFS networks.
- Predicted fire danger rating for 09/12/04 was Very High.
- Based on the fire danger rating for 09/12/04, the dispatch level was High.

Observed:

- Air Attack 440 (ATGS) was first at scene and estimated fire size to be at 5-10 acres.
- Fire was burning above and below Lumsden Road but had not backed completely down-slope to the Tuolumne River.
- Fire behavior for the entire right flank was backing fire; fire behavior for the entire left flank and the head was active head fire and some spotting. ATGS predicted the fire would go to the top of the ridge.

- Fire activity at the accident site was moving laterally cross-slope at 1-3 feet per minute, with flame lengths < 12 in.
- Fire above the road had established itself in a dead snag near the fire's edge and about forty feet up-slope from the road. The snag was burning about forty feet off the ground.
- Based on witness statements and supported by burn indicators, just seconds before the fire run or simultaneous to the fire run, but not connected to it, a spot fire was observed at the base of the cut bank almost directly across the road from where the line location went downhill.
- Witness statements indicate that during the burnover a sudden and unanticipated wind shift changed the fire spread from a cross-slope backing fire to an up-slope head fire for a period of approximately 30 seconds.
- The wind shift that occurred lasted approximately two minutes. After the two-minute wind shift, the wind changed back to its previous condition and did not change again during the burning period.

Environmental Factors

Wind

- Witness statements indicate that prior to the burnover, the observed wind was steady up-canyon, at WSW, 3 to 5 mph.
- A wind shift occurred that changed the fire spread from a cross-slope backing fire to an up-slope head fire that over ran the crew.
- Fire behavior modeling estimated wind velocity increased to approximately 7 mph and the direction changed to NNE during the burnover.
- After the burnover, the wind velocity and direction changed back to its previous condition and did not change again during the burning period.

Smoke/Visibility

- As shown on the ATGS video, while Crew 404 was conducting their size-up, smoke limited visibility below Lumsden Road which made it difficult to locate an accessible route to the river through the burn.
- Smoke was not a factor or hindrance to line construction prior to the burnover.
- Smoke during the burnover reduced visibility between the road and the river and initially hampered rescue efforts.

Temperature

- Temperatures in the area of the accident site were estimated at 89-94 F.

Terrain

- Slopes measured in the general fire area below Lumsden Road range from 80 to 120 percent.
- Slope measured at the accident site is 90 percent.
- Soils at the accident site are loose and gravelly making footing difficult.

Incident Management

Initial Fire Report

- Initial report of the smoke was from Duckwall Lookout at 1233 hours. Initial location report was at Sweetwater Campground.
- At approximately 1245 Smith Peak Lookout reported a cross azimuth on the smoke which corrected the location to Tuolumne River drainage.

Initial Resource Response

- The following resources were dispatched at the initial response: 2 Chief Officers, 6 Engines, 1 Water Tender, 1 Air Attack, 2 Air Tankers and 1 Helicopter.
- The STF Helicopter was not on base and available for initial attack to the Tuolumne Fire; it was assigned to another incident on an adjoining unit.

Objectives

- The STF has designated the Tuolumne River drainage in the area of the accident site as "full suppression;" all fires are to be fully suppressed.
- STF dispatched a standard wildland fire response to the reported incident.

Strategy

- No strategy was announced by the IC.
- Initial strategy, although not announced by IC, appeared to be to anchor the right flank below Lumsden Road with Helitack Crew 404 supported by STF Engine 43.
- When the ATGS was asked by the IC to make some drops on the heel to secure it, the ATGS stated, "I am not concerned about that area. My priority is further up the right flank."
- Concurrent strategy was to provide structure protection as needed in the area of Drew Meadow with STF Engine 42.

Tactics Employed

- Direct attack with Airtankers and Copter 404 was initiated above Lumsden Road.
- Air drops were being effective at that location in minimizing fire spread.
- No aerial resources attacked the fire below Lumsden Road prior to the burnover.
- No ground resources other than the Helitack Crew 404 engaged the right flank of the fire prior to the burnover.
- The HC selected Downhill/Indirect line construction as the ground engagement tactic.
- Line construction began at Lumsden Road approximately 170 horizontal feet above the proposed end point at the high-water level of the Tuolumne River.
- Fireline construction was approximately 7 feet from the fire's edge at the start point and widened to approximately 30 feet off the fire's edge as line construction progressed downhill.
- Saw work extended to within 30 feet of the high water level of the river, approximately 140 horizontal feet downhill from Lumsden Road.
- Scraping of handline reached 80 to 100 feet downslope.
- A firing-out operation was conducted from Lumsden Road down the constructed handline just short of the position of Firefighter Schicke, approximately 25 feet from the road.
- The HC directed one firefighter to "lookout" in addition to donning a back pump, looking for spots, making sure the line holds and supporting the firing operation; Firefighter Boatman accepted this assignment and returned to Lumsden Road. He did not hear HC tell him to be a lookout.

Safety Briefings

- There was a face-to-face briefing between the Incident Commander (IC) and Helitack Captain (HC) prior to engagement of the fire. HC was unaware of IC's identity.
- There was a face-to-face briefing between the IC and STF Engine Captain 43 prior to the burnover.
- The IC indicated to both the HC and STF Engine Captain 43 that there was "good black" at the fires edge with "minimal fire activity."
- HC indicated to his crew that the designated safety zones were "the river and the road into the black or the green."

- All crewmembers stated that using the "black" as a safety zone is always an option even if not specifically designated.
- The HC indicated that the escape routes to the safety zones were down the hill to the river, up the line to the road and then move into the green or black.
- After briefing by HC, the helitack crewmembers were invited to express their opinions about the tactical assignment; none expressed any concern or opposition.

Instructions Given

- The IC told HC on the ground to "size things up to see if there is some place that they could safely anchor the fire and start doing some action."
- The HC on the ground understood from IC "anchor the fire from the road to the river bottom."
- The ATGS stated to Copter 404 "secure the right flank up around the right shoulder and then down."
- The IC assigned Captain 43 to scout the area and support Helitack Crew 404 if possible.
- The HC assigned specific tool order and work assignments to Helitack Crew.

Control Mechanisms

Span of Control

- No issues exceeding span of control guidelines were present.
- The IC had placed orders for additional resources and overhead before the burnover occurred.
- The 30-Mile Hazard Abatement Checklist was being considered/implemented at the time of the burnover.

Radio Communications

- Copter 404 was dispatched to the fire from Columbia airbase.
- Copter 404 received the assigned radio frequencies for the incident prior to departure (Tactical net, Air to Ground, Air to Air, Command net).
- Copter 404 received a tactical assignment from ATGS to drop off the crew and begin dropping water at the bottom of the right flank.
- There was no radio communication between Copter 404 and the IC.
- The HC monitored the assigned tactical frequency and overheard traffic between IC and ATGS.
- Helitack Crew 404 crew utilized two portable radios for communications.
- The IC had good communications with the ATGS over the incident, but "spotty" communications with STF dispatch while at the fire scene.

Ongoing Evaluations

- The IC drove to the right flank of the fire where it intersected Lumsden Road and evaluated this portion of the fire.
- The HC had a chance to observe the lower portion of the right flank of the fire from the copter as they were orbiting in preparation for landing.
- The HC personally scouted approximately 70 feet below Lumsden Road on the right flank before starting work. He visually observed the remainder of the right flank down to the river from that location.
- Two firefighters scouted along Lumsden Road toward the left flank looking for access to the lower portion of the fire.
- The assigned ATGS was evaluating and providing feedback to the IC while orbiting the fire.
- The ATGS had a video camera and filmed approximately 30 minutes of the fire. The burnover was not filmed.

Standard Firefighting Orders

Of the Standard Firefighting Orders the following were not fully followed:

3. Base all actions on current and expected behavior of fire:

Actions were based on the observed fire behavior up to the time of the wind shift. The wind shift was unanticipated by the HC, the IC and the ATGS. Incorporation of appropriate mitigation measures based on LCES and Watch Out Situations were addressed primarily for observed fire behavior and not expected behavior.

4. Identify escape routes and safety zones and make them known:

HC did identify escape routes and safety zones to his crew; the escape route to the road proved to be inadequate when the flareup occurred.

5. Post lookouts when there is possible danger:

A dedicated lookout was not posted that could observe the crew or fire behavior above and below the road. It was assumed by the HC that all crewmembers were lookouts in addition to their other duties. There is no evidence that a dedicated lookout would have given an earlier warning to the crew of the flareup occurring. The ATGS was in an orbit on the right flank and was observing the area at the time of the flareup.

7. Maintain prompt communications with your forces, your supervisor and adjoining forces:

After the initial briefing between the IC and HC, there was no further communication. There was no communication between HC and ATGS to advise of their location below road on right flank and no communication between the first at scene engine and HC.

8. Give clear instructions and ensure they are understood:

Instructions given by IC and instructions received by HC regarding line assignment were not jointly understood or discussed again. Instructions were given by ATGS to Copter 404 to start dropping water at the bottom of the right flank. Copter 404 started dropping water above Lumsden Road on the right flank.

9. Maintain control of your forces at all times:

IC did not identify himself as the IC to HC during initial briefing. IC did no follow up communication with HC regarding progress, situation, etc.

10. Fight fire aggressively, having provided for safety first:

Firefighting was aggressive, however all Standard Firefighting Orders and the Watch Out Situations were not considered adequately; an adequate margin of safety was not provided for.

18 Watch Out Situations

Ten "Watch Out" Situations applied:

1. Fire not scouted and sized up:

The HC personally walked down the right flank approximately 70 feet below Lumsden Road before starting work. He visually observed the remainder of the right flank (approximately 170 horizontal feet) down to the river from that location. Two firefighters scouted up river approximately 300 feet along Lumsden Road looking for access to the fire but were unsuccessful in locating an access location. Complete scouting or walking the proposed fireline was not accomplished prior to engagement.

3. Safety zones and escape routes not identified:

HC did identify escape routes and safety zones to his crew; the escape route to the road proved to be inadequate when the flareup occurred.

5. Uninformed on strategy, tactics and hazards:

The IC described the current fire situation, with regard to the lower right flank, to HC. No overall strategy or priorities were announced by IC. Strategy of anchoring the fire at the right flank was discussed between the IC and HC, no discussion regarding downhill line construction or indirect tactics took place, no controls or restrictions prevented the use of these tactics. The IC did not know the tactics being utilized by the HC.

6. Instructions and assignments not clear:

Instructions given by IC and instructions received by HC regarding line assignment were not jointly understood or discussed again. Instructions were given by ATGS to Copter 404 to start dropping water at the bottom of the road and move up the right flank. Copter 404 started dropping water above Lumsden Road on the right flank.

8. Constructing fireline without a safe anchor point:

HC believed he had established an anchor point at the road for downhill/indirect line construction. The fire above the road continued to burn laterally and had the potential to outflank their position, however this did not occur. The goal of the HC was to "anchor to the river; that was going to be our real anchor."

9. Building fireline downhill with fire below:

Helitack Crew 404 was building fireline downhill on a portion of line that had uncontrolled fire below their position. When the flareup occurred, the fire overran the crew. No mitigations to reduce the potential hazard of fire coming from below, such as water drops from the Helicopter, were utilized.

11. Unburned fuel between you and the fire:

Physical evidence indicates that the fireline being constructed varied between 7 and 30 feet from the fires edge. Unburned fuel and the crew's location on the slope allowed the fire to overrun their position before they could utilize their escape routes. There had not been time to fire-out all unburned fuel between the main fire and the constructed fireline as was planned.

13. On a hillside where rolling material can ignite fuel below:

While no rolling burning materials were observed, the potential existed for this to occur and the result would be an uphill fire run that could overtake the position of the crew. No mitigations to reduce this hazard, such as water drops from the Helicopter, were utilized.

15. Wind increases and/or changes direction:

There was no advance warning or prediction that a wind change would occur, however wind changes in steep narrow canyons with confluence drainages are common and should be expected. Tiny fluctuations in wind were noted moments before the flareup.

17. Terrain and fuels make escape to safety zones slow and difficult:

Steep slopes and loose soils, were primary contributors to the difficulty of travel, which made the uphill escape route inadequate. Uphill fire rate of spread was more rapid than the firefighters travel time over the escape route to the upper safety zone.

Downhill Fireline Construction

The following statements describe whether or not a particular element of the CDF and/or USFS policy for downhill and indirect firefighting guidelines applied.

Downhill and Indirect Firefighting Guidelines (CDF)

1. Direct attack methods shall be used whenever possible.

Fireline construction was approximately 7 feet off the fires edge at the start point and widened to approximately 30 feet off the fires edge as line construction progressed downhill.

2. ***Decision is made after thorough scouting.***

   The HC personally walked down the right flank approximately 70 feet below Lumsden Road before starting work. He visually observed the remainder of the right flank (approximately 170 feet) down to the river from that location. Two firefighters scouted up river approximately 300 feet along Lumsden Road looking for access to the fire but were unsuccessful in locating an access location. Complete scouting or walking of the entire proposed fireline was not accomplished prior to engagement.

3. ***A lookout will be posted where the fires behavior can be seen.***

   A dedicated lookout with no collateral duties was not designated; it was assumed all crewmembers were lookouts in addition to their other duties. All segments of the fireline below Lumsden Road were visible to the HC; no one was observing the fire above Lumsden Road. One firefighter was on Lumsden Road but did not have a radio. All crew members were within earshot.

4. ***Members will be able to rapidly reach a zone of safety from any point along the line if the fire unexpectedly crosses below them.***

   The fire overran one crewmember who attempted to run uphill to safety; two others had to escape through the flames downhill to safety.

5. ***A downhill line shall be securely anchored at the top.***

   Line construction began at a mid-slope road, potential was for the fire to outflank Helitack Crew 404's position above the road, however this did not happen.

6. ***Full compliance with "The Standard Fire Orders" is assured.***

   As described above, seven of the Standard Firefighting Orders were out of compliance.

Downhill Checklist (USFS)

1. ***Crew supervisor(s) and fireline overhead will discuss assignment prior to committing crew(s).***

   Specific tactics were not discussed; no restrictions prevented the use of selected tactics. The IC did not know the tactics being utilized by the HC.

2. ***Proposed fireline has been scouted by supervisor(s) of involved crew(s).***

   The HC personally walked down the right flank approximately 70 feet below Lumsden Road before starting work. He visually observed the remainder of the right flank (approximately 170') down to the river from that location. Complete scouting or walking of the entire proposed fireline was not accomplished prior to engagement.

3. ***Crew Supervisor is in direct contact with lookout that can see the fire.***

   A dedicated lookout with no collateral duties was not designated; it was assumed all crewmembers were lookouts in addition to their other duties. All segments of the fireline below Lumsden Road were visible to the HC; no one was observing the fire above Lumsden Road. One firefighter was on Lumsden Road but did not have a radio.

4. ***Rapid access to safety zone(s) in case fire crosses below crew(s).***

   Steep slopes and loose soil were primary contributors to the difficulty of travel, which made the escape routes inadequate. Uphill fire rate of spread was faster than travel time over the escape route to the upper safety zone.

5. ***Direct attack will be used whenever possible.***

   Fireline construction was approximately 7 feet off the fires edge at the start point and widened to approximately 30 feet off the fires edge as line construction progressed downhill.

6. ***Starting point will be anchored for crew(s) building fireline down from top.***

   Line construction began at a mid-slope road, potential was for the fire to outflank Helitack Crew 404's position above the road, however this did not happen.

7. ***Bottom of fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge.***

   HC visually monitored the right flank of the fire as line construction progressed downhill. The fire had the potential to spread; no action, such as helicopter water drops, were taken to secure the fire edge.

LCES

LOOKOUTS: A dedicated lookout with no collateral duties was not designated; it was assumed all crewmembers were lookouts in addition to their other duties. All segments of the fireline below Lumsden Road were visible to the HC; no one on the crew was observing the fire above Lumsden Road The HC believed "all" crewmembers had the responsibility to be a lookout. One firefighter was told to move up to Lumsden Road, retrieve a back pump, support the firing operation and "kind of be like a lookout"; this firefighter did not have radio communications with the HC.

COMMUNICATIONS: The HC and the IC did not discuss the tactics being employed or current fire situation status of the lower right flank. HC did establish communications with Copter 404 and advised them of selected tactics. There were two radios being used on the Helitack 404 Crew for intra crew communications. IC did no follow up communication with HC after the initial briefing.

ESCAPE ROUTES: The uphill escape route was compromised when the wind changed and the flareup occurred; of the two firefighters who used it, only one made it to safety. Steep slopes and loose soils, were primary contributors to the difficulty of travel, which made the uphill escape route inadequate. Uphill fire rate of spread was faster than travel time over the escape route to the upper safety zone. The lower or downhill escape route was also compromised for two firefighters as they had to escape through the flames to safety. Two other firefighters who used the lower escape route through the green, escaped unharmed.

SAFETY ZONES: There were three safety zones: the river, the road and the black. The river safety zone did protect the four fire personnel who reached it from any flame related injury. The firefighter who ran uphill to Lumsden Road had to immediately move east into the burn to escape the heat as the flareup was occurring. The firefighter standing on Lumsden Road moved west into the green to escape. The use of the black or burn safety zone lower on the slope was attempted initially by two firefighters, but was abandoned due to residual heat present.

Involved Personnel Profiles

Qualifications

- All Firefighters and overhead were qualified by their agency for the positions they held on the fire.

Training

- All personnel were certified by their agency as having received "refresher" or "beginning of season" training in fire behavior, safety and related subjects.
- There are no lesson plans in the CDF 4300 procedures handbook that address downhill/indirect line construction.
- Downhill/indirect firefighting guidelines are addressed in the CDF 7000 policy manual.
- The use of the "6 Minutes for Safety" program was used to train in downhill/indirect tactics.
- The HC based all his decisions on the observed fire behavior, not on potential fire behavior.

Operational Period Length/Fatigue

- This was the first operational period of an initial attack fire.
- All firefighters were within the work/rest guidelines established by their agency.
- Both HCs and two firefighters had returned from normal days off on 09/12/04.

Attitudes

- Several members of Helitack Crew 404 stated that their assignment on the Tuolumne Fire was "routine, it would take a short time to complete."
- The HC statement indicates that "it's standard Helitack procedure" in reference to building fireline downhill.

Leadership

- The IC was not formally designated by name from STF dispatch on either the tactical or command frequency.
- The IC did not identify himself to the HC as being the IC during their briefing.
- The IC used both the call sign "Tuolumne IC" and "Division 4" while communicating on the radio to STF dispatch and ATGS.
- The IC did not establish controls or conditional approval on tactics to the HC, or require situation updates.
- The IC ordered additional resources in preparation for an emerging fire.
- After the burnover the IC facilitated medivac efforts by ordering air ambulance services, notified Agency Administrator of the burnover and facilitated relieving involved individuals from fireline duties.
- The HC supervised his crew at the scene of action.
- The HC organized search efforts for the missing firefighter.

Equipment

Availability

- All personal protective equipment (PPE) was available to and used by involved individuals at the time of the burnover.
- PPE included; Nomex shirts and pants, hard hat with protective face shrouds, safety glasses and/or goggles, leather gloves and emergency fire shelters.

Performance/Non-Performance

- All personal protective equipment performed within design limitations.
- One firefighter received radiant heat burns through his Nomex. The Nomex did not melt or burn.
- No fire shelters were deployed.

Firefighting Equipment/Tools

- There were no non-performance issues with any of the firefighting equipment used by Helitack 404 Crew.
- All equipment was used for its intended purpose.
- Firefighting equipment used by Helitack 404 Crew included; one chainsaw, one chainsaw gas pack, five scraping tools (Rhyno type), five full (5 gallon) back pack pumps and two portable radios.

Causal Factors

Report approved by Board of Review May 11, 2005.

Causal Factors

After analyzing the information and evidence available, the Accident Investigation Team determined that there were five (5) primary causal factors for this accident which are described below. Had any of these factors not occurred or been appropriately considered, it is probable that the accident would not have occurred.

CDF Definition:

A causal factor is any behavior, condition, act or omission that starts or sustains an accident occurrence. Avoiding or eliminating the factor would prevent the occurrence. Events which sustain the occurrence sequence but were normal to the situations as they developed are not causal factor(s). (CDF Serious Accident Investigation Guide)

USFS Definition:

A causal factor is any behavior or omission that starts or sustains an accident occurrence. (FS 0367-2808-MTDC)

Synopsis of incident

CDF Helitack Crew 404 was constructing fireline downhill from the road to the river using a chainsaw to cut brush and scraping tools to build fireline, followed by using a fusee to fire-out the unburned fuel.

The triggering event that caused this fatal accident was the wind shift and resultant critical increase in fire behavior. The change in wind direction was not anticipated by the helitack crew captain or crew members. This abrupt wind change created a flareup and running fire front that overran the position of the seven crew members.

A change in wind direction and speed occurred without warning. A wind change was not factored into the plan for the downhill line construction method the crew was using. Their mitigation measures did not account for the wind change and failed to work.

The wind change caused the increased fire behavior that entrapped the crew. Had other mitigations been in place or considered, it is probable that the entrapment would not have occurred.

"Expected" fire behavior should include the probable worst-case for the location and situation.

Five (5) causal factors identified by the Accident Investigation Team

- The wind shift changed the fire environment resulting in increased fire intensity and rate of spread.
- Unburned fuel between the fireline and the fire's edge did not allow for a sufficient margin of safety.
- Escape routes were inadequate to allow sufficient time for the firefighters to reach safety zones.
- The steepness of terrain and difficulty of travel influenced the tactical decisions to access and anchor the right flank.
  a. The crew determined that safe access to the bottom of the fire was not possible via the river or down the slope either through the burn or the green. This conclusion influenced their decision to utilize the downhill line construction tactic in lieu of uphill line construction.

b. Inadequate consideration was given to the difficulty of travel back up the steep slope and the effect of degradation of surface traction caused by fire line construction and firefighters walking on the loose soils on the slope.

- Helicopter water drops were available but not used. Fire engine hose-lay support was an option readily available but unknown to the helitack crew captain.

The wind shift changed the fire environment resulting in increased fire intensity and rate of spread.

The primary cause of the flareup was a shift in wind direction, which changed a slow, backing cross-slope fire into a rapidly spreading up-slope fire. The flareup overran the helitack crew. The wind shift occurred without warning and lasted for only 1 to 2 minutes. The wind shift was not anticipated. However, wind shifts in steep narrow canyons with confluence drainages should be expected.

Deep river drainages, such as the Tuolumne River, frequently experience wind shifts and eddies. Local airflows are influenced by the physical shape of the terrain in the canyon causing wind eddies. This is common in steep sided river canyons with convoluted terrain like that in the Tuolumne River canyon. Review of the Air Attack 440 video and post-incident observations on the ground indicate the first 75 to 100 vertical feet above the entrapment location may be particularly sensitive to this occurring. Variations in aspect and fuels may have also created localized heating differences that could contribute to changeable air flow patterns. Local airflow may have also been influenced by indrafts into the fire above the road that were occasionally strong enough to briefly override the up-canyon wind, creating occasional changes in smoke drift.

- ***The wind shift that occurred on this fire was not anticipated by the incident commander, the air tactical group supervisor, or the helitack crew.***
- ***Since a steady up-canyon wind had been observed by all the parties, they based their actions on "current" fire behavior without giving adequate consideration to "expected" fire behavior. The sudden wind direction change was part of a localized weather pattern with unpredictable timing.***
- ***Constant observation of the area for over thirty minutes prior to the flareup gave no advance warning that a wind shift was imminent. No similar wind shift was observed on this section of line the remainder of the day.***
- ***The fire cause investigation team and the accident investigators were in the immediate area of the accident for the next several days. They observed steady gentle up-canyon winds like the day of the accident. They also experienced wind shifts of short duration, but none similar in direction to the one experienced by the helitack crew.***
- ***An "unexpected" wind shift was a primary causal factor in this fatality. It has been identified as a common denominator in numerous previous fatal wildland fire accidents. Firefighters should anticipate wind shifts. Wind shifts should not be "unexpected;" tactics and mitigations must take wind shifts into consideration.***

Unburned fuel between the fireline and the fire's edge did not allow for a sufficient margin of safety.

The helitack crew was building fireline downhill from the road to the river using a chainsaw to cut brush and scraping tools to cut and Improve line. The fireline was constructed parallel to the fire's edge and only partially completed when the flareup occurred. They were using a fusee to create blackline by firing the fireline from the road.

- The tactic utilized was technically indirect line construction since there was unburned fuel between the fireline and the main fire. However it does not meet the classic definition of "Indirect Attack." ***Indirect attack by definition is line construction "a considerable distance" from the main fire.[1] This fireline was being built 7 to 30 feet from the main fire. The method is consistent with a tactic historically called "Parallel Attack."***

[1] CDF Manual section 4320.1 Student Information

- *The short distance of unburned fuel between the fire's edge and the fireline allowed the fire to overrun the crew before they could utilize their escape routes in time. In addition, the burning fuel (particularly the brushy area below the road which presented a physical barrier) prevented the crew members from crossing the fire's edge into the black.*
- *Firing out of the unburned fuel from the road down was not sufficient to provide a safe fireline because it was incomplete. While firing out is an appropriate technique, not enough had been completed to be effective.*

Fire Line Construction Prior to Flareup

Escape routes were inadequate to allow sufficient time for the firefighters to reach safety zones.

Escape routes are the primary mitigation factor for indirect downhill line construction tactic in the event a dangerous condition develops. The escape routes were sufficient for the low-intensity flanking fire behavior observed prior to flareup but were not adequate for the fire behavior that developed after the wind shift.

When the wind shifted and the fire behavior changed, the crew members utilized the escape routes previously identified, "down to the river," "up to the road" and the default "into the black." However, two of the escape routes were too difficult to traverse.

~ ***The "Down to the river" escape route was satisfactory for FF Fraser and FF Agustin.*** They skirted around the edge of the advancing fire front in the green and made it to the river safety zone without injury.

~ ***The "Up to the road" escape route was inadequate due to difficulty of travel because of steepness (80–120% slope), loose soil conditions and rocky terrain.*** The rate of spread of the fire exceeded the speed of the escaping firefighters. FF Neveau barely made it to the safety zone. FF Schicke was right behind FF Neveau, but she was unable to reach the safety zone in time and was overrun by fire. She died from inhalation of superheated gases before reaching the road.

~ ***The "Into the black" escape route utilized by Captain Winger and FF Andahl was marginally effective.*** Although they made it to the safety zone at the river, both suffered injuries because of the heat, steepness of the slope and difficulty of terrain.

The steepness of terrain and difficulty of travel influenced the tactical decisions to access and anchor the right flank.

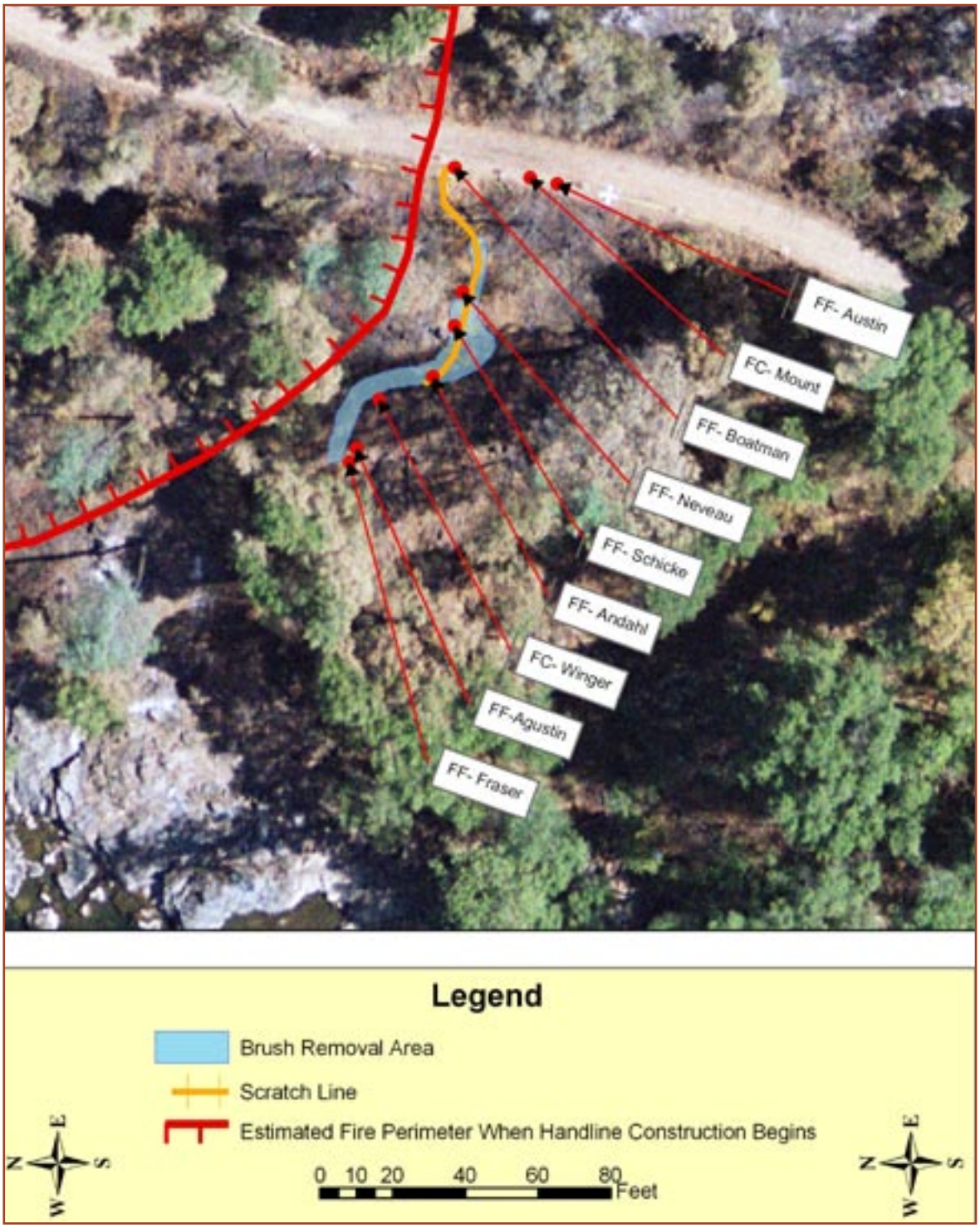
The terrain and difficulty of travel limited the options for approaching the fire and limited the tactical methods considered to complete the strategic objective of anchoring the right flank.

a. The crew determined that safe access to the bottom of the fire was not possible via the river or down the slope either through the burn or the green. This conclusion influenced their decision to utilize the downhill line construction tactic in lieu of uphill line construction.

b. Inadequate consideration was given to the difficulty of travel back up the steep slope and the effect of degradation of surface traction caused by fire line construction and firefighters walking on the loose soils on the slope.

- ***The river's edge, consisting of cliffs, boulders and poor footing, precluded the crew from walking up the river from their landing zone (LZ) and building fireline uphill from the river.***
- ***There was no practical way for the crew to stay alongside the river from their LZ to the heel of the fire.*** This would have required a walk of over one mile attempting to jump from boulder to boulder while carrying back packs, back pumps, hand tools, chainsaw and wearing firefighting boots. This would have been unsafe. There were physical barriers of rock outcrops and ledges immediately upstream and downstream of the fire that blocked access to the heel of the fire from the river.
- ***The crew used Lumsden Road from the LZ to the fire because it was the most expedient route.***
- ***The crew scouted for an access point from the road to the river in order to utilize an uphill line construction tactic. After preliminary scouting from the road near the fire edge, the crew determined there was no apparent usable access to the river.***
  - FF Boatman was familiar with the canyon and scouted up Lumsden Road past the right flank of the fire to see if access to the bottom could be made from the Lumsden Bridge. Similar to hiking in from the LZ, such an access would require an unsafe route along the river's edge.
  - The firefighters did not see a safe route through the burn to the river.
  - The only other option to access the river would have been to go down through the green. The only place to do that quickly was the same opening they used to construct fireline.

- *The steepness of the 80 to 120 percent slope combined with loose soil, rock out crops and drop offs made travel slow and difficult. This situation was a significant factor in the selection of the tactical options of downhill line construction.*
- *They did not consider withdrawing from the assignment.*



Personnel Location Prior to Flareup

Helicopter water drops were available but not used. Fire engine hose-lay support was an option readily available but unknown to the helitack crew captain.

There were missed opportunities to utilize available water application tools. The tools included helicopter drops and fire engine support that were close by. If the tools had been used, the selected tactic would likely have changed and may have prevented the burnover of the crew.

Helicopter drops:

- Copter 404 was the first helicopter at the fire and had access to the bottom of the fire.
- There was an instruction from the ATGS to Copter 404 to drop on the right flank, starting from the bottom; Copter 404 understood the direction to be to start above the road and work up the right flank to support the air tanker drops.
- Copter 404 did make water drops on the right flank of the fire but began the drops above the road. Water drops above the road were effective in reducing the heat and slowing the fire spread. There were no physical barriers or other obstacles to preclude water drops below the road.
- The IC initiated a discussion with the ATGS on the tactical frequency regarding using the copter to anchor the right flank of the fire at the river, below the road. IC Johnson asked about using "the helicopter to anchor up the right flank below the road." ATGS Ward stated that he didn't think the area below the road was a problem and the higher priority was further up the right flank. The IC accepted the ATGS recommendation.

  [Note: In post accident interviews the ATGS thought that the copter had already made drops in the area below the road and that the IC was referring to the use of the Helitack crew below the road. It was not clear to ATGS Ward where the crew was. At the time of the flareup, he thought that they were above the road.]
- Water drops could have been requested by the Helitack Captain to support their fireline construction below the road, but such a request did not occur.

Hose-lay or fire engine support:

- There was inadequate communication about the presence of an engine for hose-lay support. Any one of three individuals could have verified the proximity of engine support. The Helitack Captain could have monitored the command net or inquired as to the availability of engine support. The IC could have notified him that he had assigned STF E-43 to support their operation. STF E-43 captain could have notified the Helitack Captain that they were in the area to support their operation. HC Winger stated that if he had been aware of a fire engine close that could support his fireline construction, he may have utilized a different tactic.
- The assignment to tie in the fire from the road to the river was well suited to a fire engine hose-lay or hose stream. The fire engine crew could have put in a hose-lay direct on the fire edge, utilized hose streams from the roadway to wet down the unburned fuel and extinguish the fire edge or supported the firing operation. By being able to cool down the burned area, a direct line construction tactic would undoubtedly be used. It is likely that the indirect downhill fireline construction tactic would have been deferred for the hose-lay.

Contributory Factors

Contributory Factors

CDF Definition:

A contributory factor is any behavior, condition, act or omission that affected the occurrence or outcome but was not causal. Avoiding or eliminating the factor would not necessarily prevent the occurrence. (CDF Serious Accident Investigation Guide)

Six (6) contributory factors identified by the Accident Investigation Team.

- HC Winger had limited experience in indirect and downhill line construction.
- Incident actions were based more on current fire behavior and less on expected fire behavior.
- Downhill line construction has inherent dangers due to the nature of the tactic.
- There were incident command and control shortfalls.
- More thorough scouting prior to implementing downhill fireline construction could have led to utilization of a different tactic or withdrawal from the assignment.
- The safety zone in the black was not accessible.

HC Winger had limited experience in indirect and downhill line construction.

Experience is the application of training and knowledge. Through experience, people validate their training. They learn by doing and reinforce what works and what doesn't work. The more diverse experience an individual has, the greater the likelihood that they have "seen a similar situation" before. They remember the results and utilize that memory in their decision making process.

HC Winger met the minimum qualifications for his position and incident assignment. He had limited experience with indirect and downhill fireline construction. HC Winger's experience consisted of:

- CDF Helitack Captain for eight (8) weeks at Columbia Helitack, July 2004 through September 2004, CDF Tuolumne-Calaveras Unit. During this period HC Winger had 21 documented fire assignments totaling 10.3 hours.
- Type 1 CDF Fire Crew Captain at Pine Grove Camp for 2 years, July 2002 through July 2004, CDF Amador El Dorado Unit. During these 2 years he had 23 documented fire assignments.
- CDF Fire Apparatus Engineer-Paramedic (FAE-P) for 2 years, 2000-2002, CDF Amador-El Dorado Unit. Limited wildland fire experience and no handcrew experience.
- Firefighter - Paramedic with the Pioneer Fire Protection District for 2.5 years.
- Volunteer Firefighter with Pioneer Fire Protection District for 2.5 years.

Incident actions were based more on current fire behavior and less on expected fire behavior.

Underestimating potential fire behavior contributed to this accident. Wind shifts, fuel conditions and topography affected this fire's behavior. An innocuous backing fire suddenly changed to an uphill fire run with a rapid rate of spread. Personnel on the incident that had personally observed the fire burning in the area prior to the accident did not recognize this potential.

The fire was moving deceptively slowly and "almost out" along the right flank below the road. This condition lulled personnel into a false sense of security which caused them to underestimate potential fire behavior.

Base all action on current and expected behavior of the fire. (Ten Standard Fire Fighting Orders)

The transition from a slow spreading, low-intensity fire to a fast-moving, high intensity fire often occurs rapidly. This seems to surprise firefighters most often in live fuels, possibly because green vegetation is associated with reduced ignition risk. The exact mechanisms triggering these transitions are not fully understood by fire behavior analysts. However observations of past fire behavior indicate that such transitions often occur when there are changes in wind speed or direction, fire location (top of the slope versus base of the slope), or in the quantity of live and dead components in the vegetation canopy.

"Expected" fire behavior should include the probable worst-case for the location.

Wind conditions

The fire area was videotaped and observed by ATGS Ward for more than thirty minutes prior to the flareup. The smoke below the road, near the accident site, showed no obvious signs of varying from the steady, up-canyon wind direction. This is consistent with conditions reported by IC Johnson and HC Winger.

There were some indications just prior to the flareup that a wind shift might occur. Helitack firefighters observed flames "fluttering" on the fire edge moments before the flareup. The smoke column on another section of the right flank above the road shifted momentarily, then returned to up-canyon. None of these conditions, even though observed by very experienced firefighters, triggered any alarm that a wind shift of the type that occurred was imminent.

River drainages, such as the Tuolumne River, frequently experience wind shifts and eddies. Local airflow may have been influenced by the physical shape of the terrain in the canyon causing wind eddies. This is common in steep sided river canyons with convoluted terrain like that in the Tuolumne River canyon. Review of the Air Attack 440 video and post-incident observations on the ground indicate the first 75 to 100 vertical feet above the entrapment location may be particularly sensitive to this occurring. Variations in aspect and fuels may have also created localized heating differences that could contribute to changeable air flow patterns. Local airflow may have also been influenced by indrafts into the fire above the road that were occasionally strong enough to briefly override the up-canyon wind, creating occasional wind shifts.

The fire cause investigation team and the accident investigators were in the immediate area of the accident the next several days. They observed steady gentle up-canyon winds like the day of the accident. They also experienced wind shifts of short duration but none similar in direction to the one experienced by the helitack crew.

To be successful the actions and tactics taken depended on the observed wind pattern remaining constant.

Fuel conditions

Critical live fuel moisture values contributed significantly to the increased fire spread and intensity associated with the flareup. This reduced fuel moisture contributed to the rapid fire spread in the aerial fuels of the brush patch that was adjacent to FF Neveau and FF Schicke's position below the road. Critically low live fuel moistures contributed to the rapidly spreading high intensity fire behavior observed during the flareup. Live fuel moistures sampled in close proximity to the accident site on September 17, 2004 were at critical levels for both chamise (61%) and manzanita (71%). Live fuel moistures for both chamise and manzanita were routinely sampled on the CDF Tuolumne-Calaveras Unit (approximately 20 miles northwest of the incident) and had been at critical levels since July 28, 2004.

Fire Season 2004 had record low fuel moistures throughout the Sierra Nevada. Live fuel moistures had dropped below critical stage by July 28 and continued to deteriorate. Firefighters on the initial attack of this fire had worked in similar fuel conditions on previous fires since July 28, 2004.

The critically dry fuels contributed to the rapid rate of spread when the wind shifted.

Downhill line construction has inherent dangers due to the nature of the tactic.

Downhill line construction has been central to several fatal and near miss fireline accidents. Heightened awareness and caution is necessary when using this tactic. When downhill line construction is necessary, mitigation factors must be considered. The ***Ten Standard Fire Fighting Orders*** must be followed and the ***18 Situations That Shout Watch Out*** should be addressed. There are guidelines for downhill line construction that add additional criteria to consider when using this tactic.

Avoiding downhill line construction is preferred, especially on large and complicated sections of line where escape routes are long or difficult to travel. Similar complications exist on short sections of line as is the case at this accident.

It is important to note that the CDF Guidelines and USFS Checklist for downhill and indirect fireline construction differ. Differences include: approval process, procedure for firing operations, protocol when fire is below starting point and required supervision. The two agencies' documents follow.

CDF Downhill and Indirect Firefighting Guidelines 7070.2

(October 2002)

Downhill/indirect line construction in steep terrain and fast burning fuels shall be done with extreme caution. Direct attack methods shall be used whenever possible.

The following guidelines shall be followed before firefighting commences:

- The decision to fight fire downhill is made by a competent firefighter after thorough scouting.
- Downhill line construction shall not be attempted when fire is present directly below the proposed starting point.
- The fire-line shall not lie in or adjacent to a chimney or chute that could burn out while members are in the vicinity.
- Communication is established between the members working downhill and members working uphill from below. When neither group can adequately observe the fire, communications will be established between the members and supervising overhead. At this time a lookout with communications will be posted where the fire's behavior can be seen.
- Members will be able to rapidly reach a zone of safety from any point along the line if the fire unexpectedly crosses below them.
- A downhill line shall be securely anchored at the top. Avoid under-slung line.
- Full compliance with "THE STANDARD FIRE ORDERS" is assured.

If possible line firing should be done as the line progresses, beginning from the anchor point at the top.

Reference: Section 7013.1.1
7070-5

USFS Downhill Checklist
Fireline Handbook (NFES 0065)

Downhill fireline construction is hazardous in steep terrain, fast burning fuels, or rapidly changing weather. Downhill fireline construction should not be attempted unless there is no tactical alternative. When building downhill fireline, the following is required:

- Crews supervisor(s) and fireline overhead will discuss assignments prior to committing crew(s). Responsible overhead individual will stay with job until completed (TFLD or ICT4 qualified or higher).
- Decision will be made after proposed fireline has been scouted by supervisor(s) of involved crew(s).
- LCES will be coordinated for all personnel involved.
  - *Crews Supervisor(s) is in direct contact with lookout that can see the fire.*
  - *Communications is established between all crews*
  - *Rapid access to safety zone(s) in case fire crosses below crew(s)*
- Direct attack will be used whenever possible; the fireline should be completed between anchor points before being fired out.
- Fireline will not lie in or adjacent to a chute or chimney.
- Starting point will be anchored for crew(s) building fireline down from top.
- Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge.

Helitack Crew 404 fireline tactical decision

The first tactic considered was to anchor at the river and build fireline uphill. Helitack Crew 404 did not find an access path to the river through the black or along the river bank. As FF Boatman and FF Neveau walked up Lumsden Road into the black, the slope between the road and the river became progressively steeper and smoky. The black was described as a "dirty burn." Access along the river bank was blocked on both ends by rock outcroppings and boulders. The only readily available access to the river was to traverse the grassy opening in the green where they ultimately built their fireline. If they built fireline from the bottom up, in order to fire-out the completed line, they would have to make another trip down (firing) and back up. HC Winger decided this would take too much time. In addition, he was concerned about the steepness of the slope and the more times they traveled up and down the hillside the crew would be exposed to injury from rolling rocks. When HC Winger scouted down the proposed fireline he decided that since the soil was so loose and fuel so sparse their boots would practically dig the line as they went down the hill and line construction would be quick. By the time they got to the bottom they would have practically built a scratch line already with just their boots.

Another tactic available was building direct fireline downhill. HC Winger characterized the fire as a "dirty burn." HC Winger said that his concern was staying out of the residual heat and smoke from the dirty burn and the crew members would not be able to work from the black. There was the potential of a re-burn in the brush ladder fuels that would present a similar hazard as indirect line. They would need to use the back pumps on the steep slope. HC Winger decided that this tactic would take too much time and effort.

Planned Fireline Construction

The tactic chosen was indirect downhill line construction parallel to the fire's edge. A reason given by HC Winger for going indirect was to keep the firefighters out of the heat and smoke of the dirty burn, take advantage of light fuels and they could fire it out as they went. They would not need to use the back pumps on the steep slope. He believed this method would allow them to build the fireline quickly.

The safety measures used were commensurate with the fire behavior he was observing. HC Winger did not ignore or disregard safety orders but put in place measures that were inadequate for the fire behavior that developed after the wind shift. He did not recognize the potential for severe fire behavior because he did not anticipate a significant wind shift. Consequently, when the wind shift and flareup occurred, all the crew members were not able to safely escape.

The following Watch-out Situations were not adequately mitigated (Eighteen Watch-out Situations):

• Building fireline downhill with fire below.

Constructing line downhill when there is fire below you can result in an uphill fire run that can overtake the position of the firefighters. Since the escape route is often uphill, planning for such an event is critical in mitigating the danger. Building downhill fireline using direct attack reduces the danger. The mitigation measures of using water to cool the fire and having escape routes into the black are available. The decision to use indirect downhill line construction compromised the use of these two mitigating measures.

The fire was not directly below the crew's position. However, with a wind shift and change in direction of spread, the potential of an uphill fire run must be considered and mitigated.

• On a hillside where rolling material can ignite fuel below

There is no evidence that rolling material ignited the fuel below the firefighters and caused the uphill fire run. The concern with rolling material played a part in the decision to build indirect line. The fire edge angled down-slope and up-river creating an underslung line situation.

Helitack Crew 404's intention was to build line straight downhill to avoid underslung line but the trade-off was indirect line and unburned fuel. The actual line construction as planned was not completed.

There were incident command and control shortfalls.

The command and control shortfalls that contributed to the accident were:

- confusing instructions
- IC's identity was unclear
- unclear priorities
- unclear objectives
- undisciplined communications.

Give clear instructions and ensure they are understood (Ten Standard Firefighting Orders):

There was confusion regarding actions to be taken and who was in charge.

– IC Johnson to HC Winger:

IC Johnson drove Lumsden Road to the right flank of the fire. On his way in he passed Helitack Crew 404 walking on the road near South Fork Campground. IC Johnson stated that this was the first he realized the helitack crew was at scene. *[Note: ATGS Ward had advised IC earlier on tactical net that the copter was on the ground with the crew.]*

IC Johnson continued to the right flank and observed the fire burning above and below Lumsden Road. The fire below the road had flame lengths of 6 to 12 inches and was backing very slowly against the up-canyon wind. He did not continue past the right flank for fear that he would get isolated on the other side of the fire if rolling material or a tree fell across the road. IC Johnson returned to Helitack Crew 404's location.

During a face-to-face discussion between IC Johnson and HC Winger, IC Johnson described what he had observed at the right flank. He discussed with HC Winger the need to anchor the fire between the river and the road. He told HC Winger to "size things up to see if there was some place they could safely anchor the fire and start doing some action." IC Johnson did not identify himself as the IC nor did HC Winger attempt to determine what Johnson's role was. [*Note: HC Winger later deduced that Johnson was the IC from a tactical net radio conversation he heard between IC Johnson and ATGS Ward.]*

IC Johnson believed the assignment he had given to HC Winger was to find a way to safely anchor the fire between the road and the river and report back. HC Winger thought the instruction was an action assignment to "anchor this fire on the right flank, the road down to the river," not just scout it and report back.

– ATGS Ward to Copter 404 Captain Podesta:

Copter 404 Captain Podesta asked ATGS Ward "do you want to start at the bottom of the right flank here and work our way up?" ATGS Ward replied "yes, lets see if we can secure that right flank, up around the right shoulder and then down..." *[Note: Initial discussions and instructions from ATGS Ward to Copter 404 from the air attack video]* Copter 404 began water drops on the right flank above the road. No drops were made below the road. ATGS Ward thought they would start at the river.

– Incident Commander Johnson to ATGS Ward:

After the briefing with HC Winger and while the helitack crew was hiking to the right flank, IC Johnson asked ATGS Ward on the tactical net about "using the helicopter to anchor up the right flank below the road." *[Note: from Air Attack video]* ATGS Ward stated he didn't think the area below the road was a problem and the higher priority was further up the right flank.

IC Johnson accepted ATGS Ward's recommendation and then stated that the helitack crew would be in at the right flank shortly. At the exact moment IC Johnson was describing that helitack would be anchoring the fire below the road, ATGS Ward was distracted by the Air Attack pilot on aircraft intercom about a new spot fire on the left flank. ATGS Ward did not hear IC Johnson's remarks and did not acknowledge the IC's assignment of Helitack Crew 404 below the road.

In post accident interviews ATGS Ward believed that Copter 404 had already made drops in the area below the road. At the time of the flareup ATGS Ward thought that Helitack Crew 404 was above the road. Air Attack pilot Rogers advised ATGS Ward that the helitack crew was below the road right after the flareup.

Confusion about priorities, strategy and tactics

- ***There was no announced overall strategy or priority for the incident.*** The IC and ATGS were starting to formulate one. It was clear that this fire was going to go into extended attack or major mode. The resources available were assigned to the right flank or the Drew Meadow area. By the actions taken and assignments made, the strategy appeared to be to anchor the right flank at the river, work up the right flank and across the head to keep the fire out of Drew Meadow. Firefighters on the right flank each identified their own tactic but there was no established priority to support the operation at the heel of the right flank.
- ***There was confusion about the assignment given to HC Winger by IC Johnson.***
- IC Johnson stated that he expected Winger to size-up the area and get back to him about the situation before he did anything. HC Winger understood the assignment was to anchor the fire from the road to the river. ***There were no explicit instructions given to check back with the IC, nor any effort by the IC to contact the Helitack Captain for an update. There was no effort by HC Winger to contact IC Johnson and report his findings or proposed tactical action.***
- ***IC Johnson and HC Winger did not discuss the tactics (direct, indirect, hose-lay, etc.) to be used to anchor the fire, just the strategy of doing so.*** Neither IC Johnson nor HC Winger discussed using downhill line construction as the tactic of completing the task. ***There were no restrictions about the tactic to be used.***

Maintain prompt communication with your forces, your supervisor and adjoining forces
(Ten Standard Fire Fighting Orders)

There were five missed opportunities for communications to occur that may have changed the outcome of this accident.

- ***IC Johnson did not establish any controls for HC Winger to report to him prior to initiating any tactical action.*** Had IC Johnson done so and HC Winger proposed the use of the Indirect Downhill Fireline Construction tactic, USFS protocol requires that additional consideration occur. This likely would have resulted in closer coordination by the IC or the assignment of support resources.
- ***HC Winger did not initiate a communication with IC Johnson that identified the indirect downhill line construction tactic.*** Had Captain Winger done so, USFS protocol requires that additional consideration occur. This likely would have resulted in closer coordination by the IC or the assignment of support resources.
- ***HC Winger did notify Copter 404 Captain Podesta on the tactical net that the crew was going to construct downhill fireline from the road to the river. Had Copter 404 Captain Podesta notified the IC with this information, USFS protocol requires that additional consideration occur.*** This likely would have resulted in closer coordination by the IC or the assignment of support resources.
- ***IC Johnson did not inform HC Winger that STF Engine 43 was at scene and being assigned to support the helitack crew.*** HC Winger stated that "had he known that an engine was that close he would have waited and discussed the assignment with the engine captain." Had IC Johnson notified HC Winger about STF-E43 it is probable that the indirect downhill line construction tactic would have been modified.
- ***STF Engine 43 Captain Mount did not contact HC Winger on tactical net advising that they were assigned to support the helitack crew.*** By contacting the helitack crew the engine captain could have determined if the engine could enter the area safely. HC Winger stated that "had he known that an engine was that close he would have waited and discussed the assignment with the engine captain." Had Captain Mount contacted HC Winger it is probable the indirect downhill line construction tactic would have been modified.

More thorough scouting prior to implementing downhill fireline construction could have led to utilization of a different tactic or withdrawal from the assignment.

The strategic objective was to anchor the right flank of the fire at the river. HC Winger and other members of Helitack Crew 404 quickly scouted the area of the right flank to seek a path to the river for uphill line construction, to identify fireline construction route and to identify escape routes.

More thorough scouting of the situation may have identified alternate tactics or obstacles such as the drop off at the high water line of the escape route "down to the river."

Situations determined by the helitack crew after scouting:

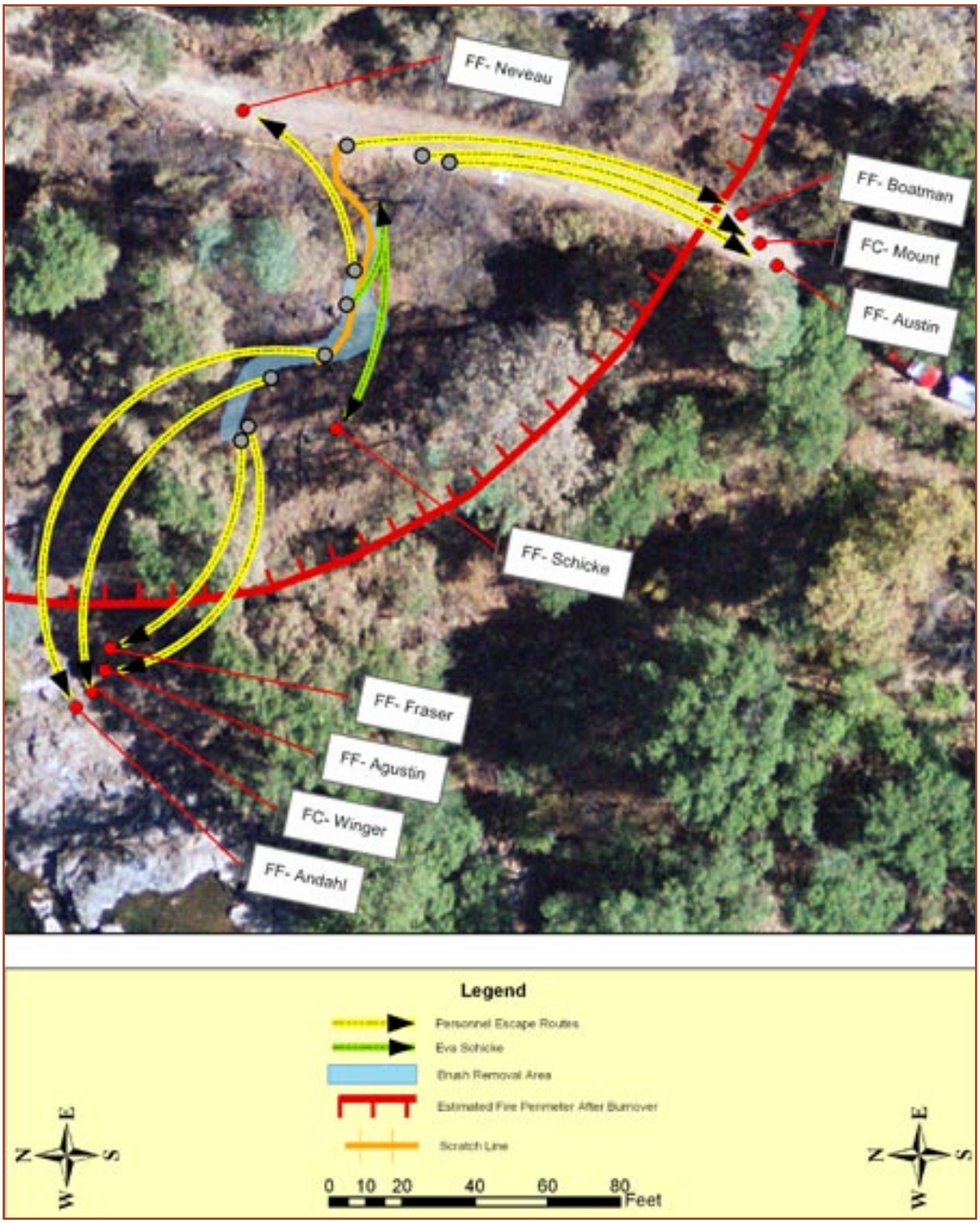
- ***They could not access the base of the right flank via the river.*** FF Boatman and FF Neveau scouted ahead to determine how close they were to the Lumsden Bridge in order to use the riverbank to access the bottom of the fire. They estimated that it was 1 to 2 miles further up the road and decided it was not feasible. Utilizing the river bank for access from the Helicopter LZ was not feasible because of rock outcroppings and boulders.
- ***They could not access the base of the right flank through the black.*** FF Boatman and FF Neveau observed the slope below the road as they scouted up Lumsden Road. The slope below the road became steeper the further up the road they went. Smoke conditions further prevented the crew from finding safe access to the river through the black.

- ***They determined it was more appropriate to construct downhill line than to access the river and build uphill line.*** To quickly access the base of the right flank through the green would have necessitated the crew walking in the grassy opening where they later started constructing fireline. Direct access to the river through the green would have required (1) moving a significant distance downstream and constructing indirect line at a considerable distance from the fire or (2) walking through the same grassy opening used for the fireline and constructing direct fireline from the river. Captain Winger concluded that it would be more efficient to construct indirect downhill fireline after observing the fire behavior below the road.
- ***An option not exercised was to withdraw from this assignment.*** An option available would have been to withdraw from fireline construction at this location and seek a safer strategic location to anchor the fire to the river.

The safety zone in the black was not accessible.

The definition and purpose of a safety zone is a place where no additional action other than being in the safety zone is necessary to prevent harm. The crew knew that in addition to the standard "into the black" safety zone, the Helitack Captain identified two other safety zones; (1) "down to the river" and (2) "up to the road and then move into the green or black."

- ***The safety zone at the river was adequate.*** Once FF Fraser and FF Agustin reached the safety zone they were out of harm's way. Shelters were not deployed nor necessary. No injuries resulted once they reached the safety zone.
- ***The safety zone at the road was adequate, but required moving on the road into the green or into the black.*** FF Neveau reached the road and moved into the black. FF Boatman was on the road and moved into the green. Shelters were not deployed nor were they necessary. No injuries resulted once they reached the safety zone.
- ***The safety zone into the black was inadequate.*** Typically going into the cooled black is a primary safety zone. However, in this instance the black below the road proved to be too hot to remain without suffering injury. HC Winger and FF Andahl ran through flaming front into the black but believed it was too hot to stay there and turned downhill to reach the safety zone at the river. They did not deploy shelters either in the "black" or at the "river" safety zones. No injuries resulted once they reached the safety zones. Because of the flaming front and unburned fuel, escape into the black was not accessible to FF Neveau and FF Schicke.



Post Burnover Crew Location

Non-related Safety Factors

Non-related Safety Factors

CDF Definition:

A non-related safety factor is an element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

Three (3) non-related safety factors were identified:

- A lookout should be posted, with no collateral duties, when there is danger.
- USFS and CDF downhill line construction guidelines differ.
- The LCES Checklist differs between, and within, the two agencies, even in publications of the same year.

Post a lookout with no collateral duties where there is danger.

The purpose of a lookout is to give early warning to firefighters to allow them to utilize their escape routes in time to reach the safety zones without injury. The lookout should be aware of the assignment, have the knowledge, skills and abilities to recognize a developing dangerous situation and the authority to sound an alarm. It is recommended that the lookout have no collateral duties, so the lookout can concentrate on the task of watching for danger.

Several helitack crew members and the ATGS observed the flareup almost simultaneously; they shouted warnings immediately.

– FF Boatman

Captain Winger recalled telling FF Boatman to go back up to the road, get a back pump to support the firing operation and be a lookout. FF Boatman did not hear a specific task to be a lookout, but he stated the assignment included "having a good visual perspective on the crew." He did have the collateral duties of donning a backpump and holding the corner. However, once at the road FF Boatman's attention was diverted to STF E-43 Captain Mount when she approached the fire edge looking for the captain of Helitack Crew 404. The flareup occurred in seconds while FF Boatman was talking with STF E-43 Captain Mount and not looking downhill.

– ATGS Ward

ATGS Ward in Air Attack 440 was above the right flank of the fire at the time of the flareup. He had a clear view of the entire right flank and did not observe any early indication of a wind shift. ATGS Ward saw the wind change almost simultaneously to the helitack crew and immediately broadcast a warning on the tactical net for crews to "get in the black, get to your safety zones."

Alternate Lookout Location

There were no alternate sites that would have allowed a lookout to detect early indicators of a wind shift.

There is no evidence that a dedicated lookout at any location could have given an earlier warning of the wind shift.

USFS and CDF downhill line construction guidelines differ.

See the comparison below.

CDF Downhill and Indirect Firefighting Guidelines 7070.2

(October 2002)

Downhill/indirect line construction in steep terrain and fast burning fuels shall be done with extreme caution. Direct attack methods shall be used whenever possible.

The following guidelines shall be followed before firefighting commences:

- The decision to fight fire downhill is made by a competent firefighter after thorough scouting.
- Downhill line construction shall not be attempted when fire is present directly below the proposed starting point.
- The fire-line shall not lie in or adjacent to a chimney or chute that could burn out while members are in the vicinity.
- Communication is established between the members working downhill and members working uphill from below. When neither group can adequately observe the fire, communications will be established between the members and supervising overhead. At this time a lookout with communications will be posted where the fire's behavior can be seen.
- Members will be able to rapidly reach a zone of safety from any point along the line if the fire unexpectedly crosses below them.
- A downhill line shall be securely anchored at the top. Avoid under-slung line.
- Full compliance with "THE STANDARD FIRE ORDERS" is assured.

If possible line firing should be done as the line progresses, beginning from the anchor point at the top.

Reference: Section 7013.1.1
7070-5

USFS Downhill Checklist Fireline Handbook (NFES 0065)

Downhill fireline construction is hazardous in steep terrain, fast burning fuels, or rapidly changing weather. Downhill fireline construction should not be attempted unless there is no tactical alternative. When building downhill fireline, the following is required:

- Crews supervisor(s) and fireline overhead will discuss assignments prior to committing crew(s). Responsible overhead individual will stay with job until completed (TFLD or ICT4 qualified or higher).
- Decision will be made after proposed fireline has been scouted by supervisor(s) of involved crew(s).
- LCES will be coordinated for all personnel involved.

  Crews Supervisor(s) is in direct contact with lookout that can see the fire.

  Communications is established between all crews

  Rapid access to safety zone(s) in case fire crosses below crew(s)
- Direct attack will be used whenever possible; the fireline should be completed between anchor points before being fired out.
- Fireline will not lie in or adjacent to a chute or chimney.
- Starting point will be anchored for crew(s) building fireline down from top.
- Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge.

The LCES Checklist differs between, and within, the two agencies, even in publications of the same year.

CDF L.C.E.S. 7070.1.3 (October 2002)

"LCES" stands for "Lookout(s), Communication(s), Escape route(s) and Safety zone(s)." These are the same items stressed in the "FIRE ORDERS" and "Watchout Situations." Each element should be evaluated independently and continuously. But of equal importance, these should also be evaluated as a system. For example, the best safety zone is of no value if your escape route does not offer timely access when needed.

The LCES system must be communicated to each firefighter prior to when it must be used. The nature of wildfire suppression dictates continuous evaluation of LCES and, when necessary, reestablishment of LCES as time and fire growth progress.

Lookouts

- Every firefighter has both the authority and responsibility to warn others when hazards become threats to safety.

Lookout(s) or scouts (roving lookouts) need to be in a position where both the hazard and the firefighter(s) can be seen. Lookouts must be trained to observe the wildland fire environment and to recognize and anticipate fire behavior changes. Each situation determines the number of lookouts that are needed. Due to terrain, cover and fire size, one lookout is normally not sufficient. When the hazard becomes a danger, the lookout relays the information to the firefighters so they may reposition to the safety zone.

Communications

- Must be able to tell other firefighters of an impending "problem"
- Must have communications

The crew must determine the method of communication(s) that will alert them of approaching hazards. Communications must be prompt and clear, whether by radio, verbal or hand signals.

Escape Routes

- Must have one and preferably two escape routes
- Must lead to safety zones

Escape routes are the paths the firefighter takes from his/her current threatened position to an area free from danger. Unlike the other components of the system, there must always be more than one escape route available as a single escape route may get cut off!

Escape routes are probably the most dynamic component of LCES as their effectiveness changes continuously. As the firefighter works along the perimeter, fatigue and spatial separation increases the time required to reach a safety zone. The most common escape route is the fireline. Be aware that on indirect or parallel fireline, problem situations can become magnified. Unless safety zones have been identified ahead as well as to the rear, firefighter retreat may not be possible.

Safety Zones

Safety zone(s) are locations where the threatened firefighter may find adequate refuge. Safety zones should be planned as a location where no shelter will be needed. This does not imply that a shelter should not be deployed if needed, only that if there is a deployment, that location is not a true safety zone. Fireline intensity and topographic location determine a safety zone's effectiveness.

USFS LCES Checklist
Fireline Handbook NFES 0065

March 2004

In the wildland fire environment, Lookouts, Communications, Escape Routes, Safety Zones (LCES) is key to safe procedures for firefighters. The elements of LCES form a safety system used by firefighters to **PROTECT THEMSELVES AND WORK AS A TEAM WITH OTHERS.**

This system is put in place before fighting the fire: select a lookout or lookouts, set up a communication system, choose escape routes and select a safety zone or zones.

LCES IS A SELF-TRIGGERING MECHANISM. Lookouts assess and reassess the fire environment and communicate threats of safety to firefighters. Firefighters use escape routes to move to safety zones.

LCES is built on two basic guidelines:

1. Before safety is threatened, each firefighter must be informed how the LCES system will be used, and
2. The LCES system must be continuously re-evaluated as conditions change.

Lookouts

- Experienced/Competent/Trusted
- Enough lookouts at good vantage points
- Knowledge of crew location
- Knowledge of escape and safety locations
- Map/Weather Kit/Watch/IAP

Communications

- Radio frequencies confirmed
- Backup and check-ins established
- Update on any situation change
- Sound alarm early, not late

Escape Routes

- More than one escape route
- Avoid uphill escape routes
- Scouted: Loose soils/rocks/vegetation
- Timed: Slowest person/fatigue and temperature factors
- Marked: Flagged for day or night (NFES 0566)
- Evaluate: Escape time vs. rate of spread
- Vehicles parked for escape

Safety Zones

- Survivable without a fire shelter
- Back into clean burn
- Natural Features: Rock areas/water/meadows
- Constructed Sites: Clearcuts/roads/helispots
- Scouted for size and hazards
- Up-slope? = more heat impact = larger safety zone
- Downwind? = more heat impact = larger safety zone
- Heavy fuels? = more heat impact = larger safety zone

Escape time and safety zone size requirements will change as fire behavior changes.

USFS
Incident Response Pocket Guide NFES 1077
LCES Checklist

January 2004

LCES must be established and known to ALL firefighters BEFORE needed.

Lookout(s)

- Experienced / Competent / Trusted
- Enough lookouts at good vantage points
- Knowledge of crew locations
- Knowledge of escape and safety locations
- Knowledge of trigger points
- Map / Weather Kit / Watch / IAP

Communication(s)

- Radio frequencies confirmed
- Backup procedures and check-in times established
- Provide updates on any situation change
- Sound alarm early, not late

Escape Route(s)

- More than one escape route
- Avoid steep uphill escape routes
- Scouted: Loose soils / Rocks / Vegetation
- Timed: Slowest person / Fatigue & Temperature factors
- Marked: Flagged for day or night
- Evaluate: Escape time vs. Rate of spread
- Vehicles parked for escape

Safety Zone(s)

- Survivable without a fire shelter
- Back into clean burn
- Natural Features: Rock Areas / Water / Meadows
- Constructed Sites: Clearcuts / Roads / Helispots Scouted for size and hazards
- Up-slope? = More heat impact = Larger safety zone
- Downwind? = More heat impact = Larger safety zone
- Heavy Fuels? = More heat impact = Larger safety zone

Escape time and safety zone size requirements will change as fire behavior changes.